

Studies of Wi-Fi Biological Effects

*WiFi frequency is **2.45 Ghz** or 5 Ghz.

2.45 Ghz (2450 MHz) is the same frequency as emitted by a microwave oven.

Rats exposed to 2.45GHz of non-ionizing radiation exhibit behavioral changes with increased brain expression of apoptotic caspase 3. Pathophysiology. 2017 Nov 14. pii: S0928-4680(17)30052-4. Varghese R, Majumdar A, Kumar G, Shukla A.

"It can be concluded that the exposure to non-ionizing radiation of 2.45 GHz caused **detrimental changes in rat brain leading to learning and memory decline and expression of anxiety behavior** along with **fall in brain antioxidants**. The exposure triggered the gene expression of caspase 3 which plays a major role in the apoptotic pathway. The chronic impact of non-ionizing radiation needs to be thoroughly evaluated in humans so that combative steps can be taken." <https://www.ncbi.nlm.nih.gov/pubmed/29153770>

RAPD Profiling, DNA Fragmentation, and Histomorphometric Examination in Brains of Wistar Rats Exposed to Indoor 2.5 Ghz Wi-Fi Devices Radiation. Biomed Res Int. 2017;2017:8653286. doi: 10.1155/2017/8653286. Ibitayo AO, Afolabi OB, Akinyemi AJ, Ojiezeh TI, Adekoya KO, Ojewunmi OO.

"In this study, the effect of Wi-Fi radiation exposure as a threat to brain health was studied using genomic analysis and histopathological study which showed the high risk of its genotoxicity especially in prolonged exposure spectrum through the findings from this study. The genomic analysis confirmed **DNA damage** due to Wi-Fi radiation toxicity and DNA damage effect which was seen through the RAPD profiles of animals from the exposed groups. The histopathological analyses also **confirmed significant deleterious alterations in the brain tissues** of Wi-Fi-exposed animals. Hence, the need to exhibit caution in handling smart devices that are used from day to day is fast becoming a threat to human health and wellness." <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5585657/>

The ameliorative effect of gallic acid on pancreas lesions induced by 2.45 GHz electromagnetic radiation (Wi-Fi) in young rats.

Journal of Radiation Research and Applied Sciences, Available online 4 May 2017. Topsakal S, Ozmen O, Cicek E, Comlekci Si.

"The histopathological examination of the pancreases indicated slight degenerative changes in some pancreatic endocrine and exocrine cells and slight inflammatory cell infiltrations in the EMR group. At the immunohistochemical examination, marked increase was observed in calcitonin gene related protein and Prostaglandin E2 expressions in pancreatic cells in this group... These findings clearly demonstrate that EMR can cause **degenerative changes in both endocrine and exocrine pancreas cells** in rats during the developmental period and GA has an ameliorative effect." <http://www.sciencedirect.com/science/article/pii/S1687850717300468>

Postnatal development and behavior effects of in-utero exposure of rats to radiofrequency waves emitted from conventional WiFi devices. Environ Toxicol Pharmacol. 2017 Apr 22;52:239-247. doi: 10.1016/j.etap.2017.04.016. Othman H, Ammari M, Rtibi K, Bensaid N, Sakly M, Abdelmelek H.

"Our main results showed that the in-utero WiFi exposure impaired offspring neurodevelopment during the first seventeen postnatal days without altering emotional and motor behavior at adult age. Besides, prenatal WiFi exposure induced cerebral oxidative stress imbalance (increase in malondialdehyde level (MDA) and hydrogen peroxide (H₂O₂) levels and decrease in catalase (CAT) and superoxide dismutase (SOD) activities) at 28 but not 43days old, also the exposure affected acetylcholinesterase activity at both cerebral and seric levels. Thus, the current study revealed that **maternal exposure to WiFi radiofrequencies led to various adverse neurological effects in the offspring by affecting neurodevelopment, cerebral stress equilibrium and cholinesterase activity.**" <https://www.ncbi.nlm.nih.gov/pubmed/28458069>

Effects of prenatal exposure to WiFi signal (2.45 GHz) on postnatal development and behavior in rat: Influence of maternal restraint.

"Behaviorally, the gestational WiFi irradiation, restraint and especially the associated treatment affected the neuromotor maturation mainly in male progeny. At adult age, we noticed **anxiety, motor deficit and exploratory behavior impairment** in male offspring co-exposed to WiFi radiation and restraint, and in female progeny subjected to three treatments. The biochemical investigation showed that, all three treatments produced global **oxidative stress in brain of both sexes**. As for serum **biochemistry, phosphorus, magnesium, glucose, triglycerides and calcium levels were disrupted**. Taken together, prenatal WiFi radiation and restraint, alone and combined, provoked several **behavioral and biochemical impairments at both juvenile and adult age** of the offspring." <https://www.ncbi.nlm.nih.gov/pubmed/28288806>

The effect of Wi-Fi electromagnetic waves in unimodal and multimodal object recognition tasks in male rats. Neurol Sci. 2017 Mar 22. Hassanshahi A, Shafeie SA, Fatemi I, Hassanshahi E, Allahtavakoli M, Shabani M, Roohbakhsh A, Shamsizadeh A.

"Results demonstrated that rats in Wi-Fi exposure groups **could not discriminate significantly between the novel and familiar objects** in any of the standard SOR, tactile SOR, visual SOR, and CMOR tests. The expression of M1 receptors increased following Wi-Fi exposure. In conclusion, results of this study showed that **chronic exposure to Wi-Fi electromagnetic waves might impair both unimodal and cross-modal encoding of information.**" <https://www.ncbi.nlm.nih.gov/pubmed/28332042>

Evaluation of the Effect of Radiofrequency Radiation Emitted From Wi-Fi Router and Mobile Phone Simulator on the Antibacterial Susceptibility of Pathogenic Bacteria *Listeria monocytogenes* and *Escherichia coli*. Published online January 23, 2017. M. Taheri, S. M. J. Mortazavi, M. Moradi, S. Mansouri, G. R. Hatam, F. Nouri.

"The pure cultures of *Listeria monocytogenes* and *Escherichia coli* were exposed to RF-EMFs generated either by a GSM 900 MHz mobile phone simulator and a common 2.4 GHz Wi-Fi router. It is also shown that exposure to RF-EMFs within a narrow level of irradiation (an exposure window) **makes microorganisms resistant to antibiotics**. This adaptive phenomenon and its potential threats to human health should be further investigated in future experiments. Altogether, the findings of this study showed that exposure to Wi-Fi and RF simulator radiation can **significantly alter the inhibition zone diameters and growth rate for *L. monocytogenes* and *E. coli***. These findings may have implications for the management of serious infectious diseases."

"Listeria monocytogenes ... was recognized as the main cause of neonatal infection, meningitis, and sepsis. Listeria infection in adult patients is related to immunocompromised systems like HIV infection, organ transplants, individuals who have received corticosteroids, and immunosuppressant drugs for their malignancies. Escherichia coli known as E coli is a common cause of life-threatening infections such as bloodstream and urinary tract infections, otitis media, and other complications."

<http://journals.sagepub.com/doi/full/10.1177/1559325816688527>

Evaluation of the Protective Role of Vitamin C on the Metabolic and Enzymatic Activities of the Liver in the Male Rats After Exposure to 2.45 GHz Of Wi-Fi Routers. J Biomed Phys Eng. 2016 Sep 1;6(3):157-164. Shekoohi-Shooli F, Mortazavi SM, Shojaei-Fard MB, Nematollahi S, Tayebi M.

"CONCLUSION: Wi-Fi exposure may exert **alterations on the metabolic parameters and hepatic enzymes activities** through **stress oxidative and increasing of free radicals**, but the use of vitamin C protects them from changing induced. Also taking optimum dose of vitamin C is essential for radioprotective effect and maintaining optimum health." <https://www.ncbi.nlm.nih.gov/pubmed/27853723>

Effect of radiofrequency radiation from Wi-Fi devices on mercury release from amalgam restorations. J Environ Health Sci Eng. 2016 Jul 13;14:12. Paknahad M, Mortazavi SM, Shahidi S, Mortazavi G, Haghani M.

"RESULTS: The mean (\pm SD) concentration of mercury in the artificial saliva of the Wi-Fi exposed teeth samples was $0.056 \pm .025$ mg/L, while it was only $0.026 \pm .008$ mg/L in the non-exposed control samples. This difference was statistically significant ($P = 0.009$).

CONCLUSION: Exposure of patients with amalgam restorations to radiofrequency radiation emitted from conventional Wi-Fi devices can **increase mercury release from amalgam restorations.**" <http://bit.ly/2abAgzp>

Effects of long-term pre- and post-natal exposure to 2.45 GHz wireless devices on developing male rat kidney. Ren Fail. 2016 Feb 24:1-10. Kuybulu AE, Öktem F, Çiriş İM, Sutcu R, Örmeci AR, Çömlekçi S, Uz E.

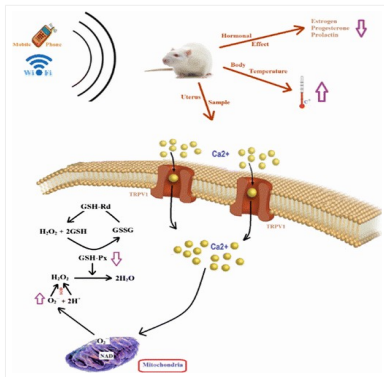
"Conclusion Based on this study, it is thought that chronic pre- and post-natal period exposure to wireless internet frequency of EMF may cause **chronic kidney damages**; staying away from EMF source in especially pregnancy and early childhood period may reduce negative effects of exposure on kidney." <http://1.usa.gov/1QCfuB6>

Does prolonged radiofrequency radiation emitted from Wi-Fi devices induce DNA damage in various tissues of rats? J Chem Neuroanat. 2016 Jan 8. pii: S0891-0618(16)00005-3. Akdag MZ, Dasdag S, Canturk F, Karabulut D, Caner Y, Adalier N.

"In conclusion, long-term exposure to 2.4GHz RF radiation (Wi-Fi) does not cause **DNA damage** of the organs investigated in this study except testes. The results of this study indicated that **testes** are more sensitive organ to RF radiation." <http://1.usa.gov/1RjKMVb>

Long-term exposure to electromagnetic radiation from mobile phones and Wi-Fi devices decreases plasma prolactin, progesterone, and estrogen levels but increases uterine oxidative stress in pregnant rats and their offspring. Endocrine. 2015 Nov 14. Yüksel M, Nazıroğlu M, Özkaya MO.

"In conclusion, although EMR exposure decreased the prolactin, estrogen, and progesterone levels in the plasma of maternal rats and their offspring, EMR-induced oxidative stress in the uteri of maternal rats increased during the development of offspring. Mobile phone- and Wi-Fi-induced EMR may be one cause of **increased oxidative uterine injury** in growing rats and **decreased hormone levels** in maternal rats." <http://1.usa.gov/1SJ5iJO>



TRPV1 cation channels are the possible molecular pathways responsible for changes in the hormone, oxidative stress, and body temperature levels in the uterus of maternal rats following a year-long exposure to electromagnetic radiation exposure from mobile phones and Wi-Fi devices. It is likely that TRPV1-mediated Ca^{2+} entry in the uterus of pregnant rats involves accumulation of oxidative stress and opening of mitochondrial membrane pores that consequently leads to mitochondrial dysfunction, substantial swelling of the mitochondria with rupture of the outer membrane and release of oxidants such as superoxide (O_2^-) and hydrogen peroxide (H_2O_2). The superoxide radical is converted to H_2O_2 by superoxide dismutase (SOD) enzyme. Glutathione peroxidase (GSH-Px) is an important antioxidant enzyme for removing lipid hydroperoxides and hydrogen peroxide and it catalyzes the reduction of H_2O_2 to water.

Oxidative stress of brain and liver is increased by Wi-Fi (2.45GHz) exposure of rats during pregnancy and the development of newborns. J Chem Neuroanat. 2015 Oct 28. pii: S0891-0618(15)00074-5. Çelik Ö, Kahya MC, Nazıroğlu M.

“In conclusion, Wi-Fi-induced oxidative stress in the brain and liver of developing rats was the result of reduced GSH-Px, GSH and antioxidant vitamin concentrations. Moreover, the brain seemed to be more sensitive to oxidative injury compared to the liver in the development of newborns.” <http://1.usa.gov/1RQpKba>

Effects of acute exposure to WIFI signals (2.45 GHz) on heart variability and blood pressure in Albinos rabbit. Environmental Toxicology and Pharmacology. 40(2):600-605. September 2015. Sali, Hanini, Smirani, et al.

“These results suggest for the first time, as far as we know, that exposure to WIFI affect heart rhythm, blood pressure, and catecholamines efficacy on cardiovascular system; indicating that radiofrequency can act directly and/or indirectly on cardiovascular system.”
 “Our results show clearly that WIFI increased heart rate and arterial blood pressure probably via direct and/or indirect pathways... Our studies point that WIFI is not completely safe at home near the animal or human body because it employ harmful radio waves. But it is safer compared to cellphone that it is close to our brain during communications. WIFI signals are everywhere. If you switched off your WiFi at night, you are still exposed to the WIFI signals coming in from neighbors but we have a significant reduction of the bioeffects of WIFI with distance from the router. Future investigations will focus on the long term bioeffects of WIFI placed at an important distance from the animal or the human.” <http://www.sciencedirect.com/science/article/pii/S1382668915300594>

What is harmful for male fertility; cell phone or the wireless internet? Kaohsiung Journal of Medical Sciences. Published online Jul 26, 2015. Yildirim et al.

“The total motile sperm count and the progressive motile sperm count decreased due to the increase of internet usage ($p = 0.032$ and $p = 0.033$, respectively). In line with the total motile sperm count, progressive motile sperm count also decreased with wireless internet usage compared with the wired internet connection usage ($p = 0.009$ and $p = 0.018$, respectively). There was a negative correlation between wireless internet usage duration and the total sperm count ($r = -0.089$, $p = 0.039$). “

“Wireless internet using durations: When we compare the wireless internet users regarding the duration of internet usage, there were a significant decrease of total motile sperm count and progressive motile sperm count ($p = 0.032$ and $p = 0.033$; respectively; Table 3) ...”
<https://www.ncbi.nlm.nih.gov/pubmed/26362961>

Effects of Wi-Fi (2.45 GHz) Exposure on Apoptosis, Sperm Parameters and Testicular Histomorphometry in Rats: A Time Course Study. Cell J. 2015 Summer;17(2): 322-31. Epub 2015 Jul 11. Shokri et al.

“We found that sperm concentration, motility and morphology were affected significantly by exposure to the 2.45 GHz RFR from a Wi-Fi antenna. The observed effects were dependent on the longevity of exposure per day.”
 “It was also shown that microwave radiation decreases the sperm count (20). A plausible explanation for the impaired sperm motility could be

induced oxidative stress by RF-EMW from Wi-Fi devices (12).”

“Considering the progressive privilege of 2.45 GHz wireless networks in our environment, we concluded that there should be a major concern about the time-dependent exposure of our body to the higher frequencies of Wi-Fi antenna.” <http://1.usa.gov/1KncYRN>

Effects of 2.4 GHz radiofrequency radiation emitted from Wi-Fi equipment on microRNA expression in brain tissue. International Journal of Radiation Biology, vol 91, no. 7, 2015, pp. 555-61. Dasdag, S., et al.

“CONCLUSION: Long-term exposure of 2.4 GHz RF may lead to adverse effects such as neurodegenerative diseases originated from the alteration of some miRNA expression and more studies should be devoted to the effects of RF radiation on miRNA expression levels. <http://www.ncbi.nlm.nih.gov/pubmed/25775055?dopt=Abstract>

Influence of microwave frequency electromagnetic radiation on terpene emission and content in aromatic plants. J Plant Physiol. 2014 Jul 8;171(15):1436-1443. Soran ML, Stan M, Niinemets U, Copolovici L.

“Microwave irradiation resulted in thinner cell walls, smaller chloroplasts and mitochondria, and enhanced emissions of volatile compounds, in particular, monoterpenes and green leaf volatiles (GLV). These effects were stronger for WLAN-frequency microwaves. Essential oil content was enhanced by GSM-frequency microwaves, but the effect of WLAN-frequency microwaves was inhibitory. There was a direct relationship between microwave-induced structural and chemical modifications of the three plant species studied.”

“The presented data collectively suggest that microwave irradiation constitute a stress to the plants, resulting in enhanced emissions of GLV, up-regulation of terpenoid emissions and modification in essential oil content and foliage anatomy. Anatomical and emission traits suggested that WLAN-frequency irradiation resulted in more severe stress than GSM-frequency irradiation, but the effect of WLAN-frequency irradiation on essential oil was inhibitory.” <http://1.usa.gov/1nERrst>

Measurements of Radiofrequency Radiation with a Body-Borne Exosimeter in Swedish Schools with Wi-Fi

imageLena K. Hedendahl^{1*}, imageMichael Carlberg², imageTarmo Koppel³ and imageLennart Hardell²
Frontiers in Public Health 5 (2017): 279.

“In Conclusion

1. The ICNIRP guidelines are based on short-term heating (thermal) effects, and are therefore not relevant to decide on the appropriateness of long-term exposure.
2. The environmental exposure to RF radiation in some schools is higher than reported levels for non-thermal biological effects. In order to reduce children’s exposure to RF radiation, schools should prefer wired network connections, allow laptop, tablets, and mobile phone usage only in flight mode and deactivate Wi-Fi access points when internet is not needed for learning purposes.”

<https://www.frontiersin.org/articles/10.3389/fpubh.2017.00279/full>

2.45 GHz Microwave radiation impairs hippocampal learning and spatial memory: Involvement of local stress mechanism induced suppression of iGluR/ERK/CREB signaling. Toxicological Sciences (2017). Shahin, Saba, et al.

“We observed that 2.45 GHz MW irradiated mice showed slow learning and significantly increased number of working and reference memory errors in radial maze task. Further, 2.45 GHz MW radiation exposure increases serum corticosterone level and the expression of CRH, CRHR1, and i-NOS, while the expression of iGluRs, n-NOS, PSD-95, protein kinase C ϵ , protein kinase A, ERK-p-ERK, CREB, and p-CREB decreases in above mentioned hippocampal subregions in a duration dependent manner. Our findings led us to conclude that 2.45 GHz MW radiation exposure induced local stress suppresses signaling mechanism(s) of hippocampal memory formation.”

<https://www.ncbi.nlm.nih.gov/pubmed/29069439>

Oxidative stress of brain and liver is increased by Wi-Fi (2.45GHz) exposure of rats during pregnancy and the development of newborns. Çelik Ö1, Kahya MC2, Nazıroğlu M3.

“An excessive production of reactive oxygen substances (ROS) and reduced antioxidant defence systems resulting from electromagnetic radiation (EMR) exposure may lead to oxidative brain and liver damage and degradation of membranes during pregnancy and development of rat pups... In conclusion, Wi-Fi-induced oxidative stress in the brain and liver of developing rats was the result of reduced GSH-Px, GSH and antioxidant vitamin concentrations. Moreover, the brain seemed to be more sensitive to oxidative injury compared to the liver in the development of newborns.” <https://www.ncbi.nlm.nih.gov/pubmed/26520617>

Effects of prenatal and postnatal exposure of Wi-Fi on development of teeth and changes in teeth element concentration in rats. Biological Trace Element Research, vol.163, no. 1-2, 2015, pp. 193-201. Ciftci, Z.Z., et al.

“...there were alterations in the elemental composition of the teeth, especially affecting such oxidative stress-related elements as copper, zinc, and iron, suggesting that short-term exposure to Wi-Fi-induced EMR may cause an imbalance in the oxidative stress condition in the teeth of growing rats.” <https://www.ncbi.nlm.nih.gov/pubmed/25395122>

Investigation of the effects of distance from sources on apoptosis, oxidative stress and cytosolic calcium accumulation via TRPV1 channels induced by mobile phones and Wi-Fi in breast cancer cells. Biochimica et Physica Acta, vol. 1848, pt B, 2015, pp. 2756-65. Cig, B. and M. Naziroglu.

"Wi-Fi and mobile phone EMR placed within 10 cm of the cells induced excessive oxidative responses and apoptosis via TRPV1-induced cytosolic Ca²⁺ accumulation in the cancer cells. Using cell phones and Wi-Fi sources which are farther away than 10 cm may provide useful protection against oxidative stress, apoptosis and overload of intracellular Ca²⁺." <https://www.ncbi.nlm.nih.gov/pubmed/25703814>

Oxidative stress of brain and liver is increased by Wi-Fi (2.45GHz) exposure of rats during pregnancy and the development of newborns. Celik, O., M.C. Kahya and M. Naziroglu. Journal of Chemical Neuroanatomy, vol. 75, pt. B, 2015, pp. 134-9.

"In conclusion, Wi-Fi-induced oxidative stress in the brain and liver of developing rats was the result of reduced GSH-Px, GSH and antioxidant vitamin concentrations. Moreover, the brain seemed to be more sensitive to oxidative injury compared to the liver in the development of newborns." <https://www.ncbi.nlm.nih.gov/pubmed/26520617>

"Effect of long-term exposure of 2.4 GHz radiofrequency radiation emitted from Wi-Fi equipment on testes functions."

Electromagnetic Biology and Medicine, vol. 34, no. 1, 2015, pp. 37-42. Dasdag, S., et al.

"Results showed that sperm head defects increased in the exposure group (p < 0.05) while weight of the epididymis and seminal vesicles, seminiferous tubules diameter and tunica albuginea thickness were decreased in the exposure group (p < 0.01, p < 0.001, p < 0.0001). However, other alterations of other parameters were not found significant (p > 0.05). We suggest Wi-Fi users to avoid long-term exposure of RF emissions from Wi-Fi equipment." <https://www.ncbi.nlm.nih.gov/pubmed/24460421>

Effects of 2.4 GHz radiofrequency radiation emitted from Wi-Fi equipment on microRNA expression in brain tissue. International Journal of Radiation Biology, vol 91, no. 7, 2015, pp. 555-61. Dasdag, S., et al.

"The results revealed that long-term exposure of RFR radiation can alter expression of some of the miRNAs, indicating that this type of exposure may lead to adverse effects such as neurodegenerative diseases originated from the alteration of some miRNA expression and more studies should be devoted to the effects of RF radiation on miRNA expression levels." <http://www.ncbi.nlm.nih.gov/pubmed/25775055>

Cognitive impairment and neurogenotoxic effects in rats exposed to low-intensity microwave radiation. International Journal of Toxicology, vol. 34, no. 3, 2015, pp. 284-90. Deshmukh, P.S., et al.

"The results showed declined cognitive function, elevated HSP70 [heat shock protein] level, and DNA damage in the brain of microwave-exposed animals. The results indicated that, chronic low-intensity microwave exposure in the frequency range of 900 to 2450 MHz may cause hazardous effects on the brain." <https://www.ncbi.nlm.nih.gov/pubmed/25749756>

Low intensity microwave radiation induced oxidative stress, inflammatory response and DNA damage in rat brain. Neurotoxicology, vol. 51, 2015, pp. 158-65. Megha, K., et al.

"The study was carried out on 24 male Fischer 344 rats, randomly divided into four groups (n=6 in each group): group I consisted of sham exposed (control) rats, group II-IV consisted of rats exposed to microwave radiation at frequencies 900, 1800 and 2450 MHz, specific absorption rates (SARs) 0.59, 0.58 and 0.66 mW/kg, respectively in gigahertz transverse electromagnetic (GTEM) cell for 60 days (2h/day, 5 days/week)...In conclusion, the present study suggests that low intensity microwave radiation induces oxidative stress, inflammatory response and DNA damage in brain by exerting a frequency dependent effect. The study also indicates that increased oxidative stress and inflammatory response might be the factors involved in DNA damage following low intensity microwave exposure." <https://www.ncbi.nlm.nih.gov/pubmed/26511840>

Exposure to non-ionizing radiation provokes changes in rat thyroid morphology and expression of HSP-90. Experimental Biology and Medicine, vol. 240, no. 9, 2015, pp. 1123-35. Misa-Agustino, M.J. et al.

"Non-ionizing radiation at 2.45 GHz may modify the morphology and expression of genes that codify heat shock proteins (HSP) in the thyroid gland... Morphological changes in the thyroid tissue may indicate a glandular response to acute or repeated stress from radiation in the hypothalamic-pituitary-thyroid axis." <https://www.ncbi.nlm.nih.gov/pubmed/25649190>

EMF radiation at 2450 MHz triggers changes in the morphology and expression of heat shock proteins and glucocorticoid receptors in rat thymus. Life Sciences, vol. 127, 2015, pp. 1-11. Misa-Agustino, M.J., et al.

"The thymus tissue presented several morphological changes, including increased distribution of blood vessels along with the appearance of red blood cells and hemorrhagic reticuloepithelial cells, while the glucocorticoid receptors presented greater immunomarking on the thymic cortex in exposed animals. These results indicate that non-ionizing sub-thermal radiation causes changes in the endothelial permeability and vascularization of the thymus, and is a tissue-modulating agent for Hsp90 and GR." <https://www.ncbi.nlm.nih.gov/pubmed/25731700>

Effects of acute exposure to WIFI signals (2.45GHz) on heart variability and blood pressure in Albinos rabbit. Environmental Toxicology and Pharmacology, vol. 40, no. 2, 2015, pp. 600-5. Saili, L., et al.

“After intravenously injection of dopamine (0.50ml/kg) and epinephrine (0.50ml/kg) under acute exposure to RF we found that, WIFI alter catecholamines (dopamine, epinephrine) action on heart variability and blood pressure compared to control. These results suggest for the first time, as far as we know, that exposure to WIFI **affect heart rhythm, blood pressure, and catecholamines efficacy on cardiovascular system**; indicating that **radiofrequency can act directly and/or indirectly on cardiovascular system**.”

<https://www.ncbi.nlm.nih.gov/pubmed/20015314>

The effects of long-term exposure to a 2450 MHz electromagnetic field on growth and pubertal development in female Wistar rats.

Electromagnetic Biology and Medicine, vol. 34, no. 1, 2015, pp. 63-7. Sangun, O., et al. 2015.

“Exposure to 2450 MHz EMF, particularly in the prenatal period, resulted in **postnatal growth restriction** and **delayed puberty in female Wistar rats**. **Increased TOS and OSI values in the brain and ovary tissues** can be interpreted as a **sign of chronic stress** induced by EMF.”

<https://www.ncbi.nlm.nih.gov/pubmed/24460416>

Impact of L-carnitine and selenium treatment on testicular apoptosis in rats exposed to 2.45GHz microwave energy. West Indian Medicine Journal, vol 64, no. 2, 2015, pp. 55-61. Saygin, M., et al.

“This study investigated if supplemental selenium (Se) and L-carnitine may reduce the adverse effect 2.45 GHz electromagnetic radiation can have on testicular apoptosis using rats as a study animal. Electromagnetic radiation exposure resulted in **testicular apoptosis in rats**, mainly by the intrinsic pathways by down-regulated expression of caspase-8. Reduction in the activation of the intrinsic pathway of apoptosis was found higher with selenium administration compared with L-carnitine administration.” <https://www.ncbi.nlm.nih.gov/pubmed/24460416>

Impact of 2.45GHz microwave radiation on the testicular inflammatory pathway biomarkers in young rats: The role of gallic acid.

Environmental Toxicology, 2015. Saygin, M., et al.

“EMR only group was shown to have **higher oxidative stress, decreased testosterone and VEGF [Vascular Endothelial Growth Factor] levels, increased prostaglandin E2 and CGRP**, as well as **decreased numbers of spermatozoa**. **Long term EMR exposure resulted in testicular physiopathology** via oxidative damage and inflammation. GA may have **ameliorative effects on the prepubertal rat testes physiopathology**.”

2.45GHz microwave radiation impairs learning and spatial memory via oxidative/nitrosative stress induced p53

dependent/independent hippocampal apoptosis: molecular basis and underlying mechanism. Toxicology Science, vol. 148, no. 2, 2015, pp. 380-99. Shahin, S., et al.

“We observed that, short-term as well as long-term 2.45 GHz MW radiation exposure **increases the oxidative/nitrosative stress leading to enhanced apoptosis in hippocampal subfield neuronal and nonneuronal cells**. Present findings also suggest that **learning and spatial memory deficit which increases with the increased duration of MW exposure** (15 < 30 < 60 days) is correlated with a **decrease in hippocampal subfield neuronal arborization and dendritic spines**. These findings led us to conclude that exposure to CW MW radiation leads to oxidative/nitrosative stress induced p53-dependent/independent activation of hippocampal neuronal and nonneuronal apoptosis associated with spatial memory loss.” <http://www.ncbi.nlm.nih.gov/pubmed/26268881>

Pneumonia, a Microorganism that Approves the Non-linear Responses to Antibiotics and Window Theory after Exposure to Wi-Fi 2.4 GHz Electromagnetic Radiofrequency Radiation. Journal of Biomedical and Physical Engineering, vol. 5, no. 3, 2015, pp. 115–20.

Taheri, M., et al. Klebsiella

“This study was aimed at investigating the alteration of antibiotic resistance of Klebsiella pneumonia, after exposure to Wi-Fi 2.4 GHz electromagnetic radiofrequency radiation from a Wi-Fi router for 3, 4.5 or 8 hours. The findings of this study show a statistically **significant rise in the sensitivity of Klebsiella pneumoniae** to different antibiotics after 4.5 hours of exposure to 2.4 GHz Wi-Fi radiation, **followed by a fall** after 8 hours of exposure. These observations can be interpreted by the concept of **non-linearity in the responses of Klebsiella pneumoniae to different antibiotics after exposure** to electromagnetic radiofrequency radiation.” <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4576872/>

What is harmful for male fertility: Cell phone or the wireless internet? Kaohsiung Journal of Medical Science, vol 31, no. 9, 2015, pp. 480-4. Yildirim, M.E., et al.

“This study aimed to assess the potential harmful effects of radiofrequency-electromagnetic radiation on sperm parameters. There was no significant difference between sperm counts and sperm morphology excluding sperm motility, due to mobile phone usage period, however **total motile sperm count and the progressive motile sperm count decreased due to the increase of internet usage** and **progressive motile sperm count also decreased with wireless Internet usage compared with the wired Internet connection usage**.”

<https://www.ncbi.nlm.nih.gov/pubmed/26362961>

Long-term exposure to electromagnetic radiation from mobile phones and Wi-Fi devices decreases plasma prolactin, progesterone, and estrogen levels but increases uterine oxidative stress in pregnant rats and their offspring. Endocrine, vol. 52, no. 2, 2015, pp. 352-62.

“Although EMR exposure decreased the prolactin, estrogen, and progesterone levels in the plasma of maternal rats and their offspring, EMR-induced oxidative stress in the uteri of maternal rats increased during the development of offspring. Mobile phone- and Wi-Fi-induced EMR may be one cause of **increased oxidative uterine injury** in growing rats and **decreased hormone levels** in maternal rats.”
<http://www.ncbi.nlm.nih.gov/pubmed/26578367>

Electromagnetic radiation (Wi-Fi) and epilepsy induce calcium entry and apoptosis through activation of TRPV1 channel in hippocampus and dorsal root ganglion of rats. *Metabolic Brain Disease*, vol. 29, no. 3, 2014, pp. 787-99. Ghazizadeh, V. and M. Naziroglu.

“In conclusion, **epilepsy and Wi-Fi in our experimental model is involved in Ca(2+) influx and oxidative stress-induced hippocampal and DRG [Dorsal Root Ganglia] death** through activation of TRPV1 channels, and negative modulation of this channel activity by CPZ pretreatment may account for the neuroprotective activity against oxidative stress.” <http://www.ncbi.nlm.nih.gov/pubmed/24792079>

Increased DNA oxidation (8-OHdG) and protein oxidation (AOPP) by Low level electromagnetic field (2.45 GHz) in rat brain and protective effect of garlic. *International Journal of Radiation Biology*, vol 90, no. 10, 2014, pp. 892-6. Gürler, H.S. et al, 2014.

“It may be concluded that low level EMF at 2.45 GHz MWR **increases the DNA damage in both brain tissues and plasma** of the rats whereas it **increases protein oxidation only in plasma.**” <https://www.ncbi.nlm.nih.gov/pubmed/24844368>

Drosophila oogenesis as a bio-marker responding to EMF sources. *Electromagnetic Biology and Medicine*, vol. 33, no. 3, 2014, pp. 165-89. Margaritis, L.H. et al.

“All EMF sources used created **statistically significant effects** regarding **fecundity and cell death-apoptosis induction**, even at very low intensity levels (0.3 V/m blue tooth radiation), well below ICNIRP's guidelines, suggesting that *Drosophila* oogenesis system is suitable to be used as a biomarker for exploring potential EMF bioactivity.”
<https://www.ncbi.nlm.nih.gov/pubmed/23915130>

Therapeutic approaches of melatonin in microwave radiations-induced oxidative stress-mediated toxicity on male fertility pattern of Wistar rats. *Electromagnetic Biology and Medicine*, vol. 33, no. 2, 2014, pp. 81-91. Meena, R., et al.“

“Microwave (MW) radiation produced by wireless telecommunications and a number of electrical devices used in household or in healthcare institutions may adversely affects the reproductive pattern. Present study aimed to investigate the protective effects of melatonin (is well known antioxidant that protects DNA, lipids and proteins from free radical damage) against oxidative stress-mediated testicular impairment due to long-term exposure of Mws. For this, 70-day-old male Wistar rats were divided into four groups (n = 6/group): Sham exposed, Melatonin (Mel) treated (2 mg/kg), **2.45 GHz** MWs exposed and MWs + Mel treated. Exposure took place in Plexiglas cages for 2 h a day for 45 days where, power density (0.21 mW/cm(2)) and specific absorption rate (SAR 0.14 W/Kg) were estimated.... results concluded that the melatonin has strong antioxidative potential against MW induced **oxidative stress** mediated **DNA damage** in testicular cells.”
<https://www.ncbi.nlm.nih.gov/pubmed/23676079>

Protective effects of melatonin against oxidative injury in rat testis induced by wireless (2.45 GHz) devices. *Andrologia*, vol. 46, no. 1 2014, pp. 65-72. Oksay, T., et al.

“In conclusion, wireless (2.45 GHz) EMR caused **oxidative damage in testis** by increasing the levels of lipid peroxidation and decreasing in vitamin A and E levels.” <https://www.ncbi.nlm.nih.gov/pubmed/23145464>

Nanometer-scale elongation rate fluctuations in the *Myriophyllum aquaticum* (Parrot feather) stem were altered by radio-frequency electromagnetic radiation. *Plant Signal Behavior*, vol. 9, no. 4, 2014. Senavirathna, M.D., et al.

“Plants were exposed to 2 GHz EMR at a maximum of 1.42 Wm(-2) for 1 h. After continuous exposure to EMR, *M. aquaticum* plants exhibited a **statistically significant 51 ± 16% reduction in NERF [nanometric elongation rate fluctuation]** standard deviation. Temperature observations revealed that EMR exposure did not cause dielectric heating of the plants. Therefore, the reduced NERF was due to a non-thermal effect caused by EMR exposure. The **alteration in NERF continued for at least 2.5 h after EMR exposure** and **no significant recovery was found in post-EMR NERF** during the experimental period.” <https://www.ncbi.nlm.nih.gov/pubmed/25764433>

Microwave irradiation adversely affects reproductive function in male mouse, *Mus musculus*, by inducing oxidative and nitrosative stress. *Free Radical Research*, vol 48, no. 5, 2014, pp. 511- 25. Shahin, S., et al.

“Twelve-week-old mice were exposed to non-thermal low-level **2.45-GHz** MW radiation (CW for 2 h/day for 30 days, power density = 0.029812 mW/cm(2) and SAR = 0.018 W/Kg)... We observed that MW irradiation induced a significant decrease in sperm count and sperm viability along with the decrease in seminiferous tubule diameter and degeneration of seminiferous tubules. Reduction in testicular 3β HSD activity and plasma testosterone levels was also noted in the exposed group of mice. Increased expression of testicular i-NOS was observed in the MW-irradiated group of mice. Further, these **adverse reproductive effects** suggest that **chronic exposure to nonionizing MW radiation may lead to infertility** via free radical species-mediated pathway.” <https://www.ncbi.nlm.nih.gov/pubmed/24490664>

Influence of microwave frequency electromagnetic radiation on terpene emission and content in aromatic plants. Journal of Plant Physiology, vol 171, no. 15, 2014, pp. 1436-43. Soran, M.-L., et al.

"The presented data collectively suggest that microwave irradiation constitute **a stress to the plants**, resulting in enhanced emissions of green leaf volatiles, up-regulation of terpenoid emissions and modification in essential oil content and foliage anatomy. Anatomical and emission traits suggested that **WLAN-frequency irradiation resulted in more severe stress than GSM-frequency irradiation**, but the effect of WLAN-frequency irradiation on essential oil was inhibitory. There was an agreement between anatomical and chemical traits with anatomically most resistant species *Apium graveolens* being chemically least responsive."

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4410321/pdf/emss-61504.pdf>

Effects of melatonin on Wi-Fi-induced oxidative stress in lens of rats. Indian Journal of Ophthalmology, vol. 62, no. 1, 2014, pp. 12-15. Tök, L., et al.

"RESULTS: Lipid peroxidation levels in the lens were slightly higher in third (**Wi-Fi**) group than in cage and sham control groups... Glutathione peroxidase (GSH-Px) activity was significantly ($P < 0.05$) lower in Wi-Fi group than in cage and sham control groups... CONCLUSIONS: There are **poor oxidative toxic effects** of one hour of Wi-Fi exposure on the lens in the animals."

<https://www.ncbi.nlm.nih.gov/pubmed/24492496>

Modulation of wireless (2.45 GHz)-induced oxidative toxicity in laryngotracheal mucosa of rat by melatonin. European Archives of Otorhinolaryngol, vol. 270, no. 5, 2013, pp. 1695-700. Aynali, G., et al.

"It is well known that **oxidative stress** induces larynx cancer, although antioxidants induce modulator role on etiology of the cancer. It is well known that electromagnetic radiation (EMR) induces oxidative stress in different cell systems. The aim of this study was to investigate the possible protective role of melatonin on oxidative stress induced by Wi-Fi (2.45 GHz) EMR in laryngotracheal mucosa of rat...The **lipid peroxidation levels were significantly ($p < 0.05$) higher** in the radiation-exposed groups than in the control and sham control groups. The lipid peroxidation level in the irradiated animals treated with melatonin was significantly ($p < 0.01$) lower than in those that were only exposed to Wi-Fi radiation. The activity of glutathione peroxidase was lower in the irradiated-only group relative to control and sham control groups but its activity was significantly ($p < 0.05$) increased in the groups treated with melatonin."

<https://www.ncbi.nlm.nih.gov/pubmed/23479077>

Detection of Low Level Microwave Radiation Induced Deoxyribonucleic Acid Damage Vis-a-vis Genotoxicity in Brain of Fischer Rats. Toxicology International, vol. 20, no. 1, 2013, pp. 19-24. Desmunkh, P.S., et al.

"Experiments were performed on male Fischer rats exposed to microwave radiation for 30 days at three different frequencies: 900, 1800 and **2450 MHz**. Animals were divided into 4 groups..."

RESULTS: In the present study, we demonstrated **DNA damaging effects** of low level microwave radiation in brain.

CONCLUSION: We concluded that low SAR microwave radiation exposure at these frequencies may induce **DNA strand breaks in brain tissue.**" <https://www.ncbi.nlm.nih.gov/pubmed/23833433>

The effect of electromagnetic radiation on the rat brain: an experimental study. Turkish Neurosurgery, vol. 23, no. 6, 2013, pp. 707-15. Eser, O.

"24 Wistar Albino adult male rats were randomly divided into four groups: group I consisted of control rats, and groups II-IV comprised electromagnetically irradiated (EMR) with 900, 1800 and **2450 MHz**."

CONCLUSION: EMR causes to **structural changes in the frontal cortex, brain stem and cerebellum** and **impair the oxidative stress and inflammatory cytokine system**. **This deterioration can cause to disease including loss of these areas function and cancer development.**"

<https://www.ncbi.nlm.nih.gov/pubmed/24310452>

Wi-Fi (2.45 GHz)- and mobile phone (900 and 1800 MHz)- induced risks on oxidative stress and elements in kidney and testis of rats during pregnancy and the development of offspring. Biological Trace Elements Research, vol. 156, no. 103, 2013, pp. 221-9. Ozorak, A., et al.

"In conclusion, Wi-Fi- and mobile phone-induced EMR **caused oxidative damage** by increasing the extent of lipid peroxidation and the iron level, while **decreasing total antioxidant** status, copper, and GSH values. Wi-Fi- and mobile phone-induced EMR may cause **precocious puberty and oxidative kidney and testis injury in growing rats.**" <https://www.ncbi.nlm.nih.gov/pubmed/24101576>

Effects of olive leaf extract on metabolic disorders and oxidative stress induced by 2.45 GHz WIFI signals. Environmental Toxicology and Pharmacology, vol. 36, no. 3, 2013, pp. 826-34. Salah, M.B., et al.

"Our investigations suggested that **RF exposure induced a diabetes-like status through alteration of oxidative response.**"

<https://www.ncbi.nlm.nih.gov/pubmed/23994945>

2.45 GHz Microwave Irradiation-Induced Oxidative Stress Affects Implantation or Pregnancy in Mice, *Mus musculus*. Applied Biochemistry and Biotechnology, vol. 169, 2013, pp. 1727–51. Shahin, S., et al.

“We observed that **implantation sites were affected significantly** in MW-irradiated mice as compared to control. Further, in addition to a significant increase in ROS [Reactive oxygen species], hemoglobin ($p < 0.001$), RBC and WBC counts ($p < 0.001$), N/L [neutrophil/lymphocyte] ratio ($p < 0.01$), DNA damage ($p < 0.001$) in brain cells, and plasma estradiol concentration ($p < 0.05$), a significant decrease was observed in NO level ($p < 0.05$) and antioxidant enzyme activities of MW-exposed mice. Our findings led us to conclude that a low level of MW irradiation-**induced oxidative stress not only suppresses implantation, but it may also lead to deformity of the embryo in case pregnancy continues**. We also suggest that MW radiation-induced oxidative stress by increasing ROS production in the body may lead to **DNA strand breakage in the brain cells** and **implantation failure/resorption or abnormal pregnancy** in mice.” <https://www.ncbi.nlm.nih.gov/pubmed/23334843>

Effects of low level electromagnetic field exposure at 2.45 GHz on rat cornea. International Journal of Radiation Biology, vol. 89, no. 4, 2012, pp. 243-9. Akar A., et al.

“The purpose of this study was to investigate the effects of low level electromagnetic field (low level-EMF) exposure, as frequently encountered in daily life (2.45 GHz, 2h/day for 21 days), on the normal adult male rat cornea using histological and stereological method. There was no statistically significant difference in mean corneal thicknesses between the groups ($p > 0.05$), however there were **statistically differences between the groups with regard to the thickness of anterior epithelium** ($p < 0.05$). Results of this preliminary study show that exposure to MW radiation might cause **alterations in the rat cornea**.” <https://www.ncbi.nlm.nih.gov/pubmed/23206266>

Immunohistopathologic demonstration of deleterious effects on growing rat testes of radiofrequency waves emitted from conventional Wi-Fi devices. Journal of Pediatric Urology, vol. 9, no. 2, 2012, pp. 223-9. Atasoy H.I. et al.

“Ten Wistar albino male rats were divided into experimental and control groups, with five rats per group. Standard wireless gateways communicating at **2.437 GHz** were used as radiofrequency wave sources. The experimental group was exposed to radiofrequency energy for 24 h a day for 20 weeks... We observed significant increases in serum 8-hydroxy-2'-deoxyguanosine levels and 8-hydroxyguanosine staining in the testes of the experimental group indicating **DNA damage due to exposure** ($p < 0.05$). We also found decreased levels of catalase and glutathione peroxidase activity in the experimental group, which may have been due to radiofrequency effects on **enzyme activity** ($p < 0.05$).

CONCLUSIONS: These findings **raise questions about the safety of radiofrequency exposure from Wi-Fi Internet access devices for growing organisms of reproductive age, with a potential effect on both fertility and the integrity of germ cells.**” <https://www.ncbi.nlm.nih.gov/pubmed/22465825>

Use Of Laptop Computers Connected To Internet Through Wi-Fi Decreases Human Sperm Motility And Increases Sperm DNA Fragmentation. Fertility and Sterility, vol. 97, no. 1, 2012, pp. 39-45. Avendaño, C., et al.

“Ex vivo exposure of human spermatozoa to a wireless internet-connected laptop **decreased motility** and **induced DNA fragmentation** by a nonthermal effect.”

“Our data suggest that the use of a laptop computer wirelessly connected to the internet and positioned near the male reproductive organs **may decrease human sperm quality**. At present we do not know whether this effect is induced by all laptop computers connected by Wi-Fi to the internet or what use conditions heighten this effect. The mechanisms involved in mediating the **decrease in sperm motility and DNA integrity** also need further study. We speculate that RF-EMW from laptop computers **wirelessly connected to the internet may be the cause of sperm damage**. However, we cannot discard the **possibility that damage to sperm is caused by the low radiation produced by the computer without internet connection**. With the caveat that these data were obtained with sperm samples incubated in vitro, **our findings suggest that prolonged use of portable computers sitting on the lap of a male user may decrease sperm fertility potential**. The potential implications of these findings warrant this report and further basic and clinical investigation.”

<https://drive.google.com/file/d/0B3AkFpxy4q9yZWJhOTVmZDgtNTE0ZS00YTtyLWl3YWQzTzQ5YTIjZjlyNTA3/view>

Protective effects of β -glucan against oxidative injury induced by 2.45-GHz electromagnetic radiation in the skin tissue of rats.

Archives of Dermatological Research, vol. 304, no. 7, 2012, 521-527. Ceyhan, A.M., et al.

“The present study demonstrated the role of oxidative mechanisms in EMR-induced **skin tissue damages** and that β -glucan could ameliorate oxidative skin injury via its antioxidant properties.” <https://www.ncbi.nlm.nih.gov/pubmed/22237725>

Pathophysiology of microwave radiation: effect on rat brain. Applied Biochemistry and Biotechnology, vol. 166, no. 2, 2012, pp. 379-88. Kesari, K.K., et al.

“The study aims to investigate the effect of **2.45 GHz** microwave radiation on Wistar rats... A **significant decrease** ($P < 0.05$) was recorded in the level of **pineal melatonin** of exposed group as compared with sham exposed. A **significant increase** ($P < 0.05$) in **creatine kinase, caspase 3, and calcium ion concentration was observed in whole brain** of exposed group of animals as compared to sham exposed. One-way analysis of variance method was adopted for statistical analysis. The study concludes that a reduction in melatonin or an increase in caspase-3, creatine kinase, and calcium ion **may cause significant damage in brain due to chronic exposure of these radiations**. These **biomarkers clearly indicate possible health implications of such exposures**.”

<https://www.ncbi.nlm.nih.gov/pubmed/22134878>

Electromagnetic fields at 2.45 GHz trigger changes in heat shock proteins 90 and 70 without altering apoptotic activity in rat thyroid gland. *Biology Open*, vol. 1, no. 9, 2012, pp. 831-39. Misa-Augustíño, M.J., et al.

"The results suggest that acute sub-thermal radiation at 2.45 GHz may **alter levels of cellular stress** in rat thyroid gland without initially altering their anti-apoptotic capacity." <https://www.ncbi.nlm.nih.gov/pubmed/23213477>

2.45-Gz wireless devices induce oxidative stress and proliferation through cytosolic Ca²⁺ influx in human leukemia cancer cells.

International Journal of Radiation Biology, vol. 88, no. 6, 2012, pp. 449–56. Nazıroğlu, M., et al.

"PURPOSE: Electromagnetic radiation from wireless devices may affect biological systems by increasing free radicals. The present study was designed to determine the effects of 2.45 GHz radiation on the antioxidant redox system, calcium ion signaling, cell count and viability in human leukemia 60 cells.

CONCLUSIONS: 2.45 GHz electromagnetic radiation appears to **induce proliferative effects through oxidative stress and Ca²⁺ influx** although blocking of transient receptor potential melastatin 2 channels by 2-aminoethyl diphenylborinate seems to counteract the effects on Ca²⁺ ions influx." <https://www.ncbi.nlm.nih.gov/pubmed/22489926>

2.45GHz (CW) microwave irradiation alters circadian organization, spatial memory, DNA structure in the brain cells and blood cell counts of male mice, *Mus musculus*. *Progress in Electromagnetics Research B*, vol. 29, 2011, pp. 23-42. Chaturvedi, C.M., et al.

"The results show that long-term radiation-exposed group exhibited a positive γ (phase angle difference) for the onset of activity with reference to lights-off timing and most of the activity occurred within the light fraction of the LD (light: dark) cycle. Microwave radiation caused an increase in erythrocyte and leukocyte counts, a **significant DNA single strand break in brain cells** and the **loss of spatial memory** in mice.

This report for the first time provides experimental evidence that continuous exposure to low intensity microwave radiation may have an **adverse effect on the brain function by altering circadian system and rate of DNA damage.**" <http://www.jpier.org/PIERB/pier.php?paper=11011205>

The effects of single and repeated exposure to 2.45 GHz radiofrequency fields on c-Fos protein expression in the paraventricular nucleus of rat hypothalamus. *Neurochemical Research*, vol. 36, no. 12, 2011, pp. 2322-32. Jorge-Mora, T., et al.

"High SAR [specific absorption rate] triggered an increase of the c-Fos marker 90 min or 24 h after radiation, and low SAR resulted in c-Fos counts higher than in control rats after 24 h. Repeated irradiation at 3 W increased cellular activation of PVN by more than 100% compared to animals subjected to acute irradiation and to repeated non-irradiated repeated session control animals. The results suggest that **PVN is sensitive to 2.45 GHz microwave radiation at non-thermal SAR levels.**" <https://www.ncbi.nlm.nih.gov/pubmed/21818659>

The therapeutic effect of a pulsed electromagnetic field on the reproductive patterns of male Wistar rats exposed to a 2.45-GHz microwave field. *Clinics (Sao Paulo)*, vol. 66, no. 7, 2011, pp. 1237–45. Kumar, S., K.K. Kesari and J. Behari.

"The results showed significant increases in caspase and creatine kinase and **significant decreases in testosterone and melatonin** in the exposed groups. This finding emphasizes that reactive oxygen species (a **potential inducer of cancer**) are the primary cause of DNA damage...

CONCLUSIONS: Electromagnetic fields are recognized as hazards that affect testicular function by generating reactive oxygen species and reduce the bioavailability of androgen to maturing spermatozoa. Thus, **microwave exposure adversely affects male fertility.**" <https://www.ncbi.nlm.nih.gov/pubmed/21876981>

Effects of radiofrequency radiation from WiFi devices on human ejaculated semen. *International Journal of Recent Research and Applied Studies*, vol. 9, no. 2, 2011, pp. 292-4. Oni, M.O., D.B. Amuda and C.E. Gilbert.

"CONCLUSION: The in-vitro pilot study of the effect of 2.4 GHz RFR exposure on human ejaculated semen had been conducted. **Sperm concentration, motility and morphology** grading of the semen were found to be **affected significantly by exposure to RFR emanating from a laptop antenna in active mode at 2.4 GHz** frequency. Being a pilot study, the results of this work can serve as a reference to further researches, most especially as wireless communication is most adopted worldwide and among the reproductive group." https://www.researchgate.net/publication/267697736_Effects_of_radiofrequency_radiation_from_WiFi_devices_on_human_ejaculated_semen

Effects of Wi-Fi signals on the p300 component of event-related potentials during an auditory hayling task. *Journal of Integrative Neuroscience*, vol. 10, no. 2, 2011, pp. 189-202. Papageorgio, C.C., et al.

"The P300 component of event-related potentials (ERPs) is believed to index **attention and working memory** (WM) operation of the brain. The present study focused on the possible gender-related effects of Wi-Fi (Wireless Fidelity) electromagnetic fields (EMF) on these processes... In conclusion, the present findings suggest that Wi-Fi exposure may exert **gender-related alterations on neural activity** associated with the amount of attentional resources engaged during a linguistic test adjusted to induce WM." <https://www.ncbi.nlm.nih.gov/pubmed/21714138>

Selenium and L-carnitine reduce oxidative stress in the heart of rat induced by 2.45-GHz radiation from wireless devices. Biological Trace Element Research, vol 143, no. 3, 2011, pp. 1640-50. Türker, Y., et al.

"The lipid peroxidation (LP) levels were higher in the radiation-exposed groups than in the control and sham control groups... The concentrations of vitamins A, C, and E were lower in the irradiated-only group relative to control and sham control groups, but their concentrations were increased in the groups treated with selenium- and L-carnitine... In conclusion, 2.45-GHz electromagnetic radiation caused oxidative stress in the heart of rats." <https://www.ncbi.nlm.nih.gov/pubmed/21360060>

Confirmation studies of Soviet research on immunological effects of microwaves: Russian immunology results.

Bioelectromagnetics, vol. 31, no. 8, 2010, pp. 589-602. Grigoriev, Y.G., et al.

"This paper presents the results of a replication study performed to investigate earlier Soviet studies conducted between 1974 and 1991 that showed immunological and reproductive effects of long-term low-level exposure of rats to radiofrequency (RF) electromagnetic fields. The early studies were used, in part, for developing exposure standards for the USSR population and thus it was necessary to confirm the Russian findings. In the present study, the conditions of RF exposure were made as similar as possible to those in the earlier experiments: Wistar rats were exposed in the far field to 2450 MHz continuous wave RF fields with an incident power density in the cages of 5 W/m² for 7 h/day, 5 days/week for a total of 30 days, resulting in a whole-body SAR of 0.16 W/kg... Our results showed the same general trends as the earlier study, suggesting possible adverse effects of the blood serum from exposed rats on pregnancy and foetal development of intact rats, however, application of these results in developing exposure standards is limited."

Mutagenic response of 2.45 GHz radiation exposure on rat brain. International Journal of Radiation Biology, vol. 86, no. 4, 2010, pp. 334-43. Kesari, K.K., et al.

"The authors conclude that the chronic exposure to 2.45 GHz microwaves may cause a significant damage to the brain, which may be an indication of possible tumour promotion." <http://www.ncbi.nlm.nih.gov/pubmed/20353343>

Effects of microwave at 2.45 GHz radiations on reproductive system of male rats. Toxicological and Environmental Chemistry, vol. 92, no. 6, 2010, pp. 1135-47. Kesari, K.K. and J. Behari.

"Chronic exposure to these radiations produced formation of apoptotic cells in testis. In addition, a significant decrease in the levels of GPx, and SOD activities as well as an increase in CAT activity was observed in the exposed group. These results indicate that a low level exposure of microwave radiations exerts a negative impact on male reproductive system function." <http://www.tandfonline.com/doi/abs/10.1080/02772240903233637>

Wi-Fi electromagnetic fields exert gender related alterations on EEG. 6th International Workshop on Biological Effects of Electromagnetic fields, 2010. Maganioti, A. E., et al.

"It is concluded that Wi-Fi may influence normal physiology through changes in gender related cortical excitability as it is reflected by the alpha and beta EEG frequencies."

[https://www.researchgate.net/publication/267816859_WI-](https://www.researchgate.net/publication/267816859_WI-FI_ELECTROMAGNETIC_FIELDS_EXERT_GENDER_RELATED_ALTERATIONS_ON_EEG)

[FI_ELECTROMAGNETIC_FIELDS_EXERT_GENDER_RELATED_ALTERATIONS_ON_EEG](https://www.researchgate.net/publication/267816859_WI-FI_ELECTROMAGNETIC_FIELDS_EXERT_GENDER_RELATED_ALTERATIONS_ON_EEG)

Effects of selenium and L-carnitine on oxidative stress in blood of rat induced by 2.45-GHz radiation from wireless devices.

Biological Trace Elements Research, vol. 132, no. 1-3, 2009, pp. 153-63. Gumral, N., et al.

"In conclusion, 2.45 GHz electromagnetic radiation caused oxidative stress in blood of rat. L-carnitine seems to have protective effects on the 2.45-GHz-induced blood toxicity by inhibiting free radical supporting antioxidant redox system although selenium has no effect on the investigated values." <https://www.ncbi.nlm.nih.gov/pubmed/19396408>

Modulator effects of L-carnitine and selenium on wireless devices (2.45 GHz)-induced oxidative stress and electroencephalography records in brain of rat. International Journal of Radiation Biology, vol 85, no. 8, 2009, pp. 680-9. Naziroğlu, M. and N. Gumral.

"CONCLUSIONS: L-carnitine and selenium seem to have protective effects on the 2.45 GHz-induced decrease of the vitamins by supporting antioxidant redox system. L-carnitine on the vitamin concentrations seems to more protective affect than in selenium."

Chronic non-thermal exposure of modulated 2450 MHz microwave radiation alters thyroid hormones and behavior of male rats.

International Journal of Radiation Biology, vol. 84, no. 6, 2008, pp. 505-13. Sinha, R.K. "

"RESULTS: Following chronic microwave exposure, rats were found hyperactive and aggressive on the 16th and 21st days. Behavioral changes in OF were analyzed and found to be significantly changed from controls (p < 0.05) for immobilization, rearing and ambulation behavior. In EPM, rats showed increased activity with decreased time spent in the open arm and more time spent in the center on the 11th (p < 0.05), 16th (p < 0.05) and 21st day (p < 0.01) after irradiation. Changes in behavioral parameters are also correlated with the trend of

changes, compared to control animals, in hormonal blood levels of T3 (decreased on the 16th day, $p < 0.05$ and 21st day, $p < 0.01$) and T4 (increased on the 21st day, $p < 0.05$).

CONCLUSION: Low energy microwave irradiation may be harmful as it is sufficient to alter the levels of thyroid hormones as well as the emotional reactivity of the irradiated compared to control animals. The purpose of this investigation was to analyze the effects of chronic 2.45 GHz leakage microwave irradiation on thyroid hormones and behavior of male rats. Behavioral changes were found to be significantly changed from controls for immobilization, rearing and ambulation behavior. Changes in behavioral parameters are also correlated with the trend of changes, compared to control animals, in hormonal blood levels of T3 and T4. Researchers concluded that low energy microwave irradiation may be harmful as it is sufficient to alter the levels of thyroid hormones as well as the emotional reactivity of the irradiated compared to control animals."

Single strand DNA breaks in rat brain cells exposed to microwave radiation. Mutation Research, vol 596, no. 1-2, 2006, pp. 76-80. Paulraj R. and J. Behari. "

"This investigation concerns with the effect of low intensity microwave (2.45 and 16.5 GHz, SAR 1.0 and 2.01 W/kg, respectively) radiation on developing rat brain... This study shows that the chronic exposure to these radiations cause statistically significant ($p < 0.001$) increase in DNA single strand breaks in brain cells of rat." <http://www.ncbi.nlm.nih.gov/pubmed/16458332>

Protein kinase C activity in developing rat brain cells exposed to 2.45 GHz radiation. Electromagnetic Biology and Medicine, vol. 25, no. 1, 2006, pp. 61-70. Paulraj R. and Behari J.

"Our study reveals a statistically significant ($p < 0.05$) decrease in PKC [Protein kinase C] activity in hippocampus as compared to the remaining portion of the whole brain and the control group. A similar experiment conducted on hippocampus and the whole brain gave a similar result. Electron microscopic study shows an increase in the glial cell population in the exposed group as compared to the control group. This present study is indicative of a significant change after exposure to the above-mentioned field intensity. This suggests that chronic exposures may affect brain growth and development." <https://www.ncbi.nlm.nih.gov/pubmed/16595335>

Effects of modulated and continuous microwave irradiation on the morphology and cell surface negative charge of 3T3 fibroblasts. Scanning Microscope, vol. 5, no. 4, 1991, pp. 1145-55. Somosy, Z., et al.

"Mouse embryo 3T3 cells were irradiated with 2450 MHz continuous and low frequency (16 Hz) square modulated waves of absorbed energy ranging from 0.0024 to 2.4 mW/g. The low frequency modulated microwave irradiation yielded more morphological cell changes than did the continuous microwave fields of the same intensity. The amount of free negative charges (cationized ferritin binding) on cell surfaces decreased following irradiation by modulated waves but remained unchanged under the effect of a continuous field of the same dose. Modulated waves of 0.024 mW/g dose increased the ruffling activity of the cells, and caused ultrastructural alteration in the cytoplasm. Similar effects were experienced by continuous waves at higher (0.24 and 2.4 mW/g) doses." <https://www.ncbi.nlm.nih.gov/pubmed/1822036>

Microwave Electromagnetic Radiations Emitted from Common Wi-Fi Routers Reduce Sperm Count and Motility International Journal of Radiation Research Vol. 13 No.4

"Conclusions: Exposure to microwave radiation emitted from Wi-Fi routers affects sperm parameters such as count and motility which are among the key parameters determining the chance of conceiving."

Some Studies on biological effects of electromagnetic radiation at cellphone, WiFi, powerline intensities

Effects of electromagnetic radiation on spatial memory and synapses in rat hippocampal CA1

"The morphological changes included mitochondrial degenerations, fewer synapses, and shorter postsynaptic densities in the radiated rats. These findings indicate that mobile phone radiation can significantly impair spatial learning and reference memory and induce morphological changes in the hippocampal CA1 region."

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4336960/>

The effect of melatonin on body mass and behaviour of rats during an exposure to microwave radiation from mobile phone.

Sokolovic D, Djordjevic B, Kocic G, Babovic P, Ristic G, Stanojkovic Z, Sokolovic DM, Veljkovic A, Jankovic A, Radovanovic Z (2012), Bratisl Lek Listy 113 (5): 265 – 269

"The authors conclude that microwave exposure could cause a body mass decrease and anxiety related behavior."

https://www.researchgate.net/profile/Zoran_Radovanovic2/publication/225055349_The_effect_of_melatonin_on_body_mass_and_behaviour_of_rats_during_an_exposure_to_microwave_radiation_from_mobile_phone/links/5573725308ae7521586a78f8/The-effect-of-melatonin-on-body-mass-and-behaviour-of-rats-during-an-exposure-to-microwave-radiation-from-mobile-phone.pdf?origin=publication_list

Heart rate variability (HRV) analysis in radio and TV broadcasting stations workers.

Bortkiewicz A, Gadzicka E, Szymczak W, Zmyslony M (2012), Int J Occup Med Environ Health: in press

"The authors concluded that exposure to radiofrequency electromagnetic fields may **affect the neurovegetative regulation of the cardiovascular system.**" <https://www.emf-portal.org/en/article/21528>

The effects of a 1.8 GHz continuous electromagnetic fields on mucociliary transport of human nasal mucosa.

In SM, Kim HJ, Park RW, Kim W, Gimm YM, Park I, Hong S, Hong JJ, Oh JH, Kahng H, Park EY (2012), Laryngoscope: in press

"The authors summarize that exposure to a 1.8 GHz electromagnetic field may **inhibit the ciliary beat frequency** via an "novel protein kinase C" dependent mechanism..." <https://www.emf-portal.org/en/article/21319>

Case-control study of paternal occupation and childhood leukaemia in Great Britain, 1962-2006.

Keegan TJ, Bunch KJ, Vincent TJ, King JC, O'Neill KA, Kendall GM, Maccarthy A, Fear NT, Mfg M (2012), Br J Cancer 107 (9): 1652 – 1659

"The authors concluded that the results show some support for a positive association between childhood leukemia risk and paternal occupation involving [electromagnetic] social contact. Additionally, the study provided additional evidence for higher occupational [electromagnetic] social class being a **risk factor for childhood leukemia.**" <http://www.emf-portal.de/viewer.php?l=e&aid=21237>

Oxidative stress induced by 1.8 GHz radio frequency electromagnetic radiation and effects of garlic extract in rats.

Avcı B, Akar A, Bilgici B, Tuncel OK (2012), Int J Radiat Biol 88 (11): 799 - 805

"The authors summarize that the exposure to a radiofrequency electromagnetic field at 1.8 GHz ... **led to protein oxidation in the brain tissue** and an increase in serum nitric oxide level." <https://www.emf-portal.org/en/article/20986>

Electromagnetic fields at 2.45 GHz trigger changes in heat shock proteins 90 and 70 without altering apoptotic activity in rat thyroid gland.

Misa Agustino MJ, Leiro JM, Jorge Mora MT, Rodriguez-Gonzalez JA, Jorge Barreiro FJ, Ares-Pena FJ, Lopez-Martin E (2012), Biol Open 1 (9): 831 – 838

"The results suggest that exposure to a 2.45 GHz electromagnetic field may alter levels of **cellular stress in rat thyroid gland.**" <http://www.emf-portal.de/viewer.php?l=e&aid=21522>

Melatonin modulates wireless (2.45 GHz)-induced oxidative injury through TRPM2 and voltage gated Ca(2+) channels in brain and dorsal root ganglion in rat.

Naziroglu M, Celik O, Ozgul C, Cig B, Dogan S, Bal R, Gumral N, Rodriguez AB, Pariente JA (2012), Physiol Behav 105 (3): 683 - 692

"The authors conclude that exposure to a wireless device of 2.45 GHz could induce **oxidative stress in the dorsal root ganglion [a nodule on the dorsal root of the spine that contains nerve cells]** ..." <http://www.emf-portal.de/viewer.php?l=e&aid=20663>

Neurodevelopmental anomalies of the hippocampus in rats exposed to weak intensity complex magnetic fields throughout gestation.

Fournier NM, Mach QH, Whissell PD, Persinger MA (2012), Int J Dev Neurosci 30 (6): 427 – 433

"These findings suggest that prenatal exposure to complex magnetic fields of a narrow intensity window during development could result in subtle but **permanent alterations in hippocampal structure and function.**" <http://www.emf-portal.de/viewer.php?l=e&aid=21080>

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure (Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities) * Click on the image or the link to access all pages.

Power Density (Microwatts/centimeter ² - $\mu\text{W}/\text{cm}^2$)	Reference
As low as (10^{-17}) or 100 Super-low intensity RF effects at MR resonant frequencies resulted in changes in genes; problems with chromatin condensation (DNA) intensities comparable to base stations	Belavue, 1997
$5 \mu\text{Watts}/\text{cm}^2$ (10^{-17})	Changed growth rates in yeast cells Grundler, 1992
$0.1 \mu\text{Watts}/\text{cm}^2$ (10^{-17}) or $100 \mu\text{Watts}/\text{cm}^2$	Super-low intensity RF effects at MR resonant frequencies resulted in changes in genes; problems with chromatin condensation (DNA) intensities comparable to base stations Belavue, 1997
$0.0004 - 0.001 \mu\text{W}/\text{cm}^2$	Chronic exposure to base station RF (whole-body) in humans showed increased stress hormones; dopamine levels substantially decreased; higher levels of adrenaline and nor-adrenaline; dose-response seen; produced chronic physiological stress in cells even after 1.5 years Buchner, 2012
$0.00034 \mu\text{W}/\text{cm}^2$	Chronic exposure to mobile phone pulsed RF significantly reduced sperm count Behari, 2006
$0.0005 \mu\text{W}/\text{cm}^2$	RF decreased cell proliferation at 960 MHz GSM 217 Hz for 30-min exposure Velickovic, 1999
$0.0006 - 0.0128 \mu\text{W}/\text{cm}^2$	Fatigue, depressive tendency, sleeping disorders, concentration difficulties, cardio-vascular problems reported with exposure to GSM 900/1800 MHz cell phone signal at base station level exposures. Oberfeld, 2004
$0.0009 \mu\text{W}/\text{cm}^2$	RF induced 10%-40% increase in DNA synthesis in glioma cells (brain) Stagg, 1997
$0.003 - 0.02 \mu\text{W}/\text{cm}^2$	In children and adolescents (9-17 yrs) short-term exposure caused headache, irritation, concentration difficulties in school. Heinrich, 2010
0.003 to $0.05 \mu\text{W}/\text{cm}^2$	In children and adolescents (9-17 yrs) short-term exposure caused conduct problems in school (behavioral problems) Thomas, 2010
$0.005 \mu\text{W}/\text{cm}^2$	In adults (30-60 yrs) chronic exposure caused sleep disturbances, (but not significantly increased across the entire population) Moller, 2010
$0.005 - 0.04 \mu\text{W}/\text{cm}^2$	Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated) Thomas, 2008
$0.01 - 0.11 \mu\text{W}/\text{cm}^2$	RF from cell towers caused fatigue, headaches, sleeping problems Navarro, 2003

Stress problems, HSP, damaged immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
Cellular damage/RCS/DNA cleavage/DNA repair failure	Cancer (other than brain), cell proliferation
Damaged calcium metabolism	Cardiac, heart muscle, blood pressure, vascular effects

<http://www.biointiative.org/report/wp-content/uploads/pdfs/BioInitiativeReport-RF-Color-Charts.pdf>

Laptops and Cellphones Adversely Affect Children and Fetuses

USA - Yale University

Fetal Radiofrequency Radiation Exposure From 800-1900 Mhz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice

"Here we demonstrate that fetal exposure to 800–1900 Mhz-rated radiofrequency radiation from cellular telephones leads to **behavioral and neurophysiological alterations that persist into adulthood**... The significant trend between the groups treated for 0, 9, 15, and 24 hours/day demonstrates that the **effects are directly proportional to usage time**..."

<http://www.nature.com/srep/2012/120315/srep00312/full/srep00312.html>

ITALY

Dept of Pediatrics, Obstetrics and Reproduction Medicine, University of Siena.

ASL 7 (Local Health Agency), Prevention Dept Physical Agents Laboratory, Siena.

CNR (Italian Research Council), Institute of Applied Physics (IFAC), Florence, Italy.

Exposure to Electromagnetic Fields From Laptop Use of "Laptop" Computers

Exposure to Electromagnetic Fields From Laptop Use of "Laptop" Computers

"In the LTCs analyzed, EMF values (range 1.8–6 μT) are within International Commission on Non-Ionizing Radiation (NIR) Protection (ICNIRP) guidelines, but are considerably higher than the values recommended by 2 recent guidelines for computer monitors magnetic field emissions, MPR II (Swedish Board for Technical Accreditation) and TCO (Swedish Confederation of Professional Employees), **and those considered risky for tumor development**... the **power supply induces strong intracorporal electric current densities in the fetus and in the adult subject**, which are respectively 182–263% and 71–483% higher than ICNIRP 98 basic restriction recommended to prevent adverse health effects." <https://www.ncbi.nlm.nih.gov/pubmed/22315933>

RUSSIA

Russian National Committee on Non-Ionizing Radiation Protection

Psychophysiological Indicators for Child Users of Mobile Communication. Message 1: Present State of the Problem

Message 2: Results of Four-year Monitoring

"It has been shown that the **children's organism is more sensitive to this kind of exposure than the adult one**. We have identified the following major trends of the psychophysiological indicators for child users of mobile communication: an increased number of **phonemic perception disorders, abatement of efficiency**, reduced indicators for the **arbitrary and semantic memory, and increased fatigue**. A steady decline of the parameters from high values to bottom standards has been found."

<http://electromagnetichealth.org/electromagnetic-health-blog/russian-res-children-emf/>

GREECE

University of Athens

Brain proteome response following whole body exposure of mice to mobile phone or wireless DECT base radiation (* Note DECT cordless phone bases emits the **SAME 2.4 GHz frequency as Wi-Fi routers and devices**)

"The observed protein expression changes may be related to **brain plasticity alterations**, indicative of **oxidative stress in the nervous system** or involved in apoptosis and might potentially explain human health hazards reported so far, **such as headaches, sleep disturbance, fatigue, memory deficits**, and **brain tumor long-term induction** under similar exposure conditions."

<http://electromagnetichealth.org/electromagnetic-health-blog/mice-proteome/>

Effects Of Wi-Fi Signals On The P300 Component Of Event-Related Potentials During An Auditory Hayling Task

"To the best of our knowledge, this is the first attempt to investigate the immediate effects of Wi-Fi signals upon brain operation, specifically on the P300 ERP component... As far as the different Hayling tasks are concerned, results show significantly decreased amplitude values for the response inhibition condition in a large area of the brain." <https://www.ncbi.nlm.nih.gov/pubmed/21714138>

Single strand DNA breaks in rat brain cells exposed to microwave radiation.

"The data showed that the chronic exposure to 2.45 and 16.5 GHz under these experimental conditions caused a statistically significant increase in DNA single-strand breaks (increase in the length of DNA migration) in brain cells of rats." <http://www.ncbi.nlm.nih.gov/pubmed/16458332>

Some behavioral effects of short-term exposure of rats to 2.45 GHz microwave radiation.

"Microwave-exposed animals exhibited less activity than sham-exposed animals... Both the locomotor activity and acoustic startle data demonstrate that, under the conditions of this experiment, microwave exposure may alter responsiveness of rats to novel environmental conditions or stimuli." <http://www.ncbi.nlm.nih.gov/pubmed/3178900>

Erythropoietic changes in rats after 2.45 GHz nonthermal irradiation.

"In the applied experimental condition, RF/MW radiation might cause disturbance in red cell maturation and proliferation, and induce micronucleus formation in erythropoietic cells." <http://www.ncbi.nlm.nih.gov/pubmed/15729835>

Genotoxic effects of low 2.45 GHz microwave radiation exposures on Sprague Dawley rats.

"We conclude that low SAR 2.45 GHz MW radiation exposures can induce DNA single strand breaks and the direct genome analysis of DNA of various tissues demonstrated potential for genotoxicity." <http://covenantuniversity.edu.ng/Profiles/Usikalu-Mojisola/EFFECTS-OF-EXPOSURE-TO-2.45-GHZ-MICROWAVE-RADIATION-ON-MALE-RAT-REPRODUCTIVE-SYSTEM>

Effects of exposure to 2.45 GHZ microwave radiation on male rat reproductive system.

"Conclusion: MW radiation exposures caused reduction in sperm counts and motility and increased the proportion of abnormal sperm cells and induced reduction in sperm count and motility while increasing the proportion of abnormal sperm cells." <http://healthdocbox.com/Infertility/69090603-Available-online-at-international-journal-of-current-research-vol-2-issue-1-pp-january-2011-research-article.html>

Testicular apoptosis and histopathological changes induced by a 2.45 GHz electromagnetic field.

"Electromagnetic field affects spermatogenesis and causes to apoptosis due to the heat and other stress-related events in testis tissue." <http://tih.sagepub.com/content/early/2011/01/27/0748233710389851.abstract>

Effects of 2.45 GHz microwaves on meiotic chromosomes of male CBA/CAY mice.

"The findings are interpreted to indicate interference with normal spermatogenesis during the exposure period." <https://www.ncbi.nlm.nih.gov/pubmed/3980975>

Laptop expositions affect motility and induce DNA fragmentation in human spermatozoa in vitro by a nonthermal effect: a preliminary report.

"We have demonstrated that exposure to laptops decrease progressive motility and induce DNA fragmentation in human spermatozoa in vitro by a non-thermal effect. We speculate that keeping the laptops (WiFi mode) on the lap near the testes may result in decreased male fertility." http://www.safeschool.ca/uploads/Laptop_Expositions.pdf

Provocation study using heart rate variability shows microwave radiation from DECT phone (2.45 Ghz) affects autonomic nervous system.

M. Havas, J. Marrongelle, B. Pollner, E. Kelley, C.R.G. Rees, L. Tully
European Journal of Oncology Library Vol. 5, 273-300

"This is the first study that documents immediate and dramatic **changes in both Heart Rate (HR) and HR variability (HRV)** associated with MW exposure at levels well below (0.5%) federal guidelines in Canada and the United States (1000 microW/cm2)."
http://www.avaate.org/article.php3?id_article=2043
http://www.avaate.org/IMG/pdf/Dect_and_WifiHavas-HRV-Ramazzini1.pdf

DNA Strand Breaks in Rat Brain Cells Exposed to Low level Microwave Radiation (2.4 GHz)- Environmental Sciences
<http://www.ursi.org/proceedings/procGA08/papers/K02bp2.pdf>

Some Studies on Biological Effects from Cell Phone Towers (pulsed Microwave Radiation similar to Wi-Fi)

Mobile Phone Mast Effects on Common Frog (*Rana temporaria*) Tadpoles: The City Turned into a Laboratory

"In the exposed group, **low coordination of movements, an asynchronous growth**, resulting in both big and small tadpoles, and a **high mortality (90%)** was observed. Regarding the control group (n ¼ 70) under the same conditions but inside a Faraday cage, the coordination of movements was normal, the development was synchronous, and a mortality of 4.2% was obtained."
<https://www.ncbi.nlm.nih.gov/pubmed/20560769>

Analyzing The Health Impacts Of Modern Telecommunications Microwaves

"The present set of experiments (a more detailed description can be found in Panagopoulos et al. 2010) showed that, the **bioactivity of GSM radiation in regards to short-term exposures is evident for radiation intensities down to 1 µW/cm2**. This value of radiation intensity is encountered at about 1 m distance from a cell-phone or about 100 m distance from a corresponding base station antenna... It is possible for **long-term exposure durations** (weeks-months-years) that the **effect would be evident at even longer distances/smaller intensities**."

"The bioactivity "windows" found in our experiments, could possibly **correlate with** recent results of another experimental group reporting that GSM radiation caused **increased permeability of the blood-brain barrier** in rat nerve cells and the strongest effect was produced by the lowest SAR values **which correspond to the weakest radiation intensity**, (Eberhardt et al 2008)."

"The effect of **cell death induction in the developing eggs** of the exposed female insects, just like the corresponding effect on the reproductive capacity... **evident for distances up to 100 cm (radiation intensities down to 1 µW/cm2)**."

<https://ecfsapi.fcc.gov/file/7520941964.pdf>

Neurobehavioral effects among inhabitants around mobile phone base stations. Neurotoxicology. 28(2):434-40 Abdel-Rassoul G, El-Fateh OA, Salem MA, Michael A, Farahat F, El-Batanouny M, Salem E (March 2007).

"Inhabitants living nearby mobile phone base stations are at risk for developing **neuropsychiatric problems** and some **changes in the performance of neurobehavioral functions** either by facilitation or inhibition. So, revision of standard guidelines for public exposure to RER from mobile phone base station antennas and using of NBTB (neurobehavioral test battery) for regular assessment and early detection of biological effects among inhabitants around the stations are recommended."
<http://www.ncbi.nlm.nih.gov/pubmed/16962663>

GSM base station electromagnetic radiation and oxidative stress in rats.

Electromagn Biol Med. ;25(3):177-88 Yurekli AI, Ozkan M, Kalkan T, Saybasili H, Tuncel H, Atukeren P, Gumustas K, Seker S (2006).

"When EM fields at a power density of 3.67 W/m2 (specific absorption rate = 11.3 mW/kg), which is well below current exposure limits, were applied, **MDA (malondialdehyde - a marker for oxidative stress) level was found to increase and GSH (reduced glutathione, a major antioxidant) concentration was found to decrease significantly** (p < 0.0001). Additionally, there was a less significant (p = 0.0190) **increase in SOD (superoxide dismutase) activity** (cell-repair) under EM exposure."

<http://www.ncbi.nlm.nih.gov/pubmed/16954120>

Risk Evaluation of Potential Environmental Hazards From Low Frequency Electromagnetic Field Exposure Using Sensitive in vitro Methods. EU Programme.

"Quality of Life and Management of Living Resources" - [View Foreword and Download Report]

"**Genotoxic effects** and a **modified expression of numerous genes and proteins** after EMF exposure could be demonstrated with **great certainty**... Since all these observations were made in in vitro studies, the results obtained neither preclude nor confirm a health risk due to EMF exposure, but they speak in favour of such a possibility."

http://www.powerwatch.org.uk/news/20041222_reflex.asp

Investigation on the health of people living near mobile telephone relay stations: //Incidence according to distance and sex.

Pathol Biol (Paris). 50(6):369-73 Santini R, Santini P, Danze JM, Le Ruz P, Seigne M (July 2002).

"Women significantly more often than men ($p < 0.05$) complained of **headache, nausea, loss of appetite, sleep disturbance, depression, discomfort and visual perturbations**. This first study on symptoms experienced by people living in vicinity of base stations shows that, in view of radio protection, minimal distance of people from cellular phone base stations should not be < 300 m."
<http://www.ncbi.nlm.nih.gov/pubmed/12168254>

Possible Effects of Electromagnetic Fields from Phone Masts on a Population of White Stork (Ciconia ciconia).

Balmori Alfonso (2005). Electromagnetic Biology and Medicine, 24: 109-119

"The total **productivity, in the nests located within 200 meters of antennae, was 0.86 ± 0.16** . For **those located further than 300 m, the result was practically doubled**, with an average of 1.6 ± 0.14 . Very significant differences among the total productivity were found ($U = 240$; $p = 0.001$, Mann-Whitney test)... **Twelve nests (40%) located within than 200 m of antennae never had chicks, while only one (3.3%) located further than 300 m had no chicks**...These results are compatible with the possibility that **microwaves are interfering with the reproduction of white storks** and would corroborate the results of laboratory research by other authors."

<http://www.tandfonline.com/doi/abs/10.1080/15368370500205472>

http://www.powerwatch.org.uk/news/20051006_storks.pdf

Increased incidence of cancer near a cell-phone transmitter station. Wolf R, Wolf D (April 2004). International Journal of Cancer Prevention Vol1, No2 -

"The measured level of RF radiation (power density) in the area was low; far below the current guidelines based on the thermal effects of RF exposure. We suggest, therefore, that the current guidelines be re-evaluated. The enormous short latency period; less than 2 years, indicates that if there is a real causal association between RF radiation emitted from the cell-phone base station and the cancer cases (which we strongly believe there is), then the RF radiation should have a very strong promoting effect on cancer at very low radiation!...

Such **unusual appearances of cancer cases** due to one accused factor on two completely different occasions is alarming."

http://www.powerwatch.org.uk/news/20050207_israel.pdf

The Influence of Being Physically Near to a Cell Phone Transmission Mast on the Incidence of Cancer.

Horst Eger, Klaus Uwe Hagen, Birgitt Lucas, Peter Vogel, Helmut Voit (April 2004). Umwelt Medizin Gesellschaft 17

"... the **risk of developing cancer for those living within 400 metres** of the mast (cell phone tower) in comparison to those living outside this area, was **three times as high**" and "the **patients fell ill at least 8 years earlier**."

<http://www.scribd.com/doc/46020865/The-Influence-of-Being-Physically-Near-to-a-Cell-Phone-Transmission-Mast-on-the-Incidence-of-Cancer>

http://www.powerwatch.org.uk/news/20041118_naila.asp0

The Microwave Syndrome - Further aspects of a Spanish Study.

Oberfeld Gerd, Navarro A. Enrique, Portoles Manuel, Maestu Ceferino, Gomez-Perretta Claudio (August 2004). Conference Proceedings.

"All models showed statistical significant associations between the measured electric field (~ 400 MHz – 3 GHz) and 13 out of 16 health related symptoms. The strongest five associations found are **depressive tendency, fatigue, sleeping disorder, difficulty in concentration and cardiovascular problems**. The symptoms associated are in line with the symptoms reported in the literature as "Microwave Syndrom... **Based on the data of this study the advice** would be to strive for levels not higher than 0.02 V/m for the sum total, which is equal to a power density of $0.0001 \mu\text{W}/\text{cm}^2$..."

http://www.powerwatch.org.uk/news/20040809_spain.asp

Mobile Telecommunications and Health

Review of the Current Scientific Research in view of Precautionary Health Protection (2000)

by ECOLOG-Institut and Commissioned by T-Mobil Germany (DeTeMobil Deutsche Telekom MobilNet GmbH)

"This review of over 220 peer-reviewed and published papers found strong indications for the **cancer-initiating** and **cancer-promoting** ... **genotoxic effects** of these fields, like single and double stranded DNA breaks and damage to chromosomes. The findings that high frequency electromagnetic fields influence **cell transformation, cell growth promotion** and cell communication also point on a **carcinogenic potential** of the fields used for mobile telephony. The study also found **teratogenic effects (birth deformities) and loss of fertility**... Moreover, **disruptions of other cellular processes**, like the synthesis of proteins and the control of cell functions by enzymes, have been demonstrated... **effects on the central nervous system**, which reach from neuro-chemical effects to modifications of the brain potentials and impairments of certain brain functions. **Loss of memory and cognitive function**...Possible risks for the brain also arise from an **increased permeability of the blood-brain barrier** to potentially harmful substances, observed in several experiments on animals exposed to mobile telephone fields.

The ECOLOG report also found indications for disruptions of the **endocrine and the immune system**...stress reactions... **increased production of stress hormones**...reduction of the concentration of the hormone melatonin.... Melatonin has a central control function for the hormone system and the diurnal biological rhythms and it is able to retard the development of certain tumours. A common observation in many of the studies was the importance of pulse modulation. **Pulse modulated fields seemed to have a stronger effect than continuous fields** and that in some cases, it was the **pulse of a certain frequency which triggered the reaction**..."

<http://www.hese-project.org/hese-uk/en/niemr/ecologsum.php>
<http://www.hese-project.org/hese-uk/en/papers/ecolog2000.pdf>

Health Effects in the vicinity of Radio/TV towers and mobile phone base stations

"EMR exposes everyone and causes **significant elevation of cancer rates across many body organs**, with **no safe threshold**. This is because of the **combination of the DNA damaging biological mechanism** of individual cells and the **reduction of melatonin** through a very sensitive brain interaction resonant process, **reducing the cell damage repair rate and increasing the free radical damage rate**." http://www.neilcherry.com/documents/90_r2_EMR_Living_Near_Broadcast_Towers_Health.pdf

Symptoms experienced by people in vicinity of base stations: II/ Incidences of age, duration of exposure, location of subjects in relation to the antennas and other electromagnetic factors.

Santini R, Santini P, Danze JM, Le Ruz P, Seigne M (September 2003). . Pathol Biol (Paris). 51(7):412-5

"Our results show significant increase ($p < 0.05$) in relation with age of subjects (elder subjects are more sensitive) and also, that the facing location is the **worst position** for some symptoms studied, especially for **distances till 100 m** from base stations."

<http://www.ncbi.nlm.nih.gov/pubmed/12948762>

Psychophysiological Indicators for Child Users of Mobile Communication. Message 1: Present State of the Problem

Message 2: Results of Four-year Monitoring

N. I. Khorseva, Yu. G. Grigoriev, N. V. Gorbunova

"It has been shown that the **children's organism is more sensitive** to this kind of exposure than the adult one. We have identified the following major trends of the psychophysiological indicators for child users of mobile communication: an **increased number of phonemic perception disorders**, **abatement of efficiency**, **reduced indicators for the arbitrary and semantic memory**, **an increased fatigue**. A steady decline of the parameters from high values to bottom standards has been found."

<http://electromagnetichealth.org/electromagnetic-health-blog/russian-res-children-emf/>

AUVA REPORT: Nonthermal Effects Confirmed; Exposure Limits Challenged; Precaution Demanded.

The Austrian Social Insurance for Occupational Risk (Allgemeine Unfallversicherungsanstalt) commissioned the Vienna Medical University to carry out its own research project in 2009

"All across Europe the debate on exposure limits has flared up; **insurance companies do not insure cell phone providers because of the incalculable health risks...**the results of the report confirm long-known health risks associated with cell phone technologies... These recommendations are **especially important for children**. Dear parents, talk with your children about them!" This is now about the **conflict between commercial interests of an industry supported by the government and the protection of public health**. The BUND warns: "The ubiquitous exposure to this **unnatural type of radiation at unprecedented levels** of power density harms human health. Short-term and long-term **health impairments** are **preprogrammed and will especially manifest in the next generation** if politically responsible actions are not taken immediately... Impacts on the Brain... **EEG changes**...already set in during the first five minutes of exposure and remained unchanged for over 50 minutes thereafter... exposure causes a **notable change in protein synthesis profiles**... At a SAR of 2 W/kg, the demonstrated effects are reproducible and statistically highly significant, but they start to show **at SAR levels as low as 0.1 W/kg** ...the protein synthesis is measurable 4 hours after the exposure starts... The increased rate of synthesis returns to normal levels within 2 hours of when exposure stops... It appears that cells do notice that some **proteins lose their function** and that this loss of function, therefore, must be **compensated for by the synthesis of new proteins...** In addition, electromagnetic exposures provoke the formation of the free radical nitric oxide, resulting in an increased rate of **DNA damage**... such a break is a **genetic disaster** for the cell because it can hardly be reconciled with the survival of the cell. The cell therefore, tries to make repairs. When doing repairs, the cell indeed survives, but at the price of errors, so-called **mutations**, creeping in. And these mutations are lasting changes, which, in turn, also bear the risk of **cancer**... One of the observations showed that, among the different cells, **those respond particularly strongly**, which are metabolically active. This cell property is especially pronounced in growing tissues that is, in **children and youth**. Consequently, these population groups would be **more susceptible** than average to the described effects."

"The ICNIRP (*standard which **Health Canada** follows*) concedes that **exposure limits only protect from "short-term, acute health impacts caused by increased temperatures in tissue and that nonthermal biological effects are not taken into account."**

http://www.buildingbiology.ca/pdf/Auva_Report.pdf

Electromagnetic Hypersensitivity: Evidence For A Novel Neurological Syndrome

"The subject demonstrated statistically reliable somatic reactions in response to exposure to subliminal EMFs under conditions that reasonably excluded a

causative role for psychological processes. Conclusion: **EMF hypersensitivity** can occur as **a bona fide environmentally-inducible neurological syndrome**."

Dr. David McKeown Medical Officer of Health to Toronto Board of Health (2007)

Subject: Prudent Avoidance Policy on Siting Telecommunication Towers and Antennas

"The Board of Health should encourage Health Canada to review current standards and set public exposure limits for RFs under Safety Code 6 so as to be 100 times more protective."

http://www.toronto.ca/health/hphe/pdf/boh_report.pdf

Environmental Pollution on Microwave Radiation - A Potential Threat to Human Health

A 1973 Canadian Research Report

"In view of the expected proliferation of MW devices in many different applications, a substantial increase in MW background activity is feared that may endanger human health. On this basis strict control of the use of these devices must be introduced while present safety standards are revised and extensive research is conducted into long term effects of exposure to low intensity MW radiation. In particular, a study of possible accumulative effects of MW radiation (directly or indirectly) through sensitization must be conducted."

http://www.next-up.org/pdf/EMF_NRC_Canada_1973_microwave_threat.pdf

Declassified U.S. Navy Report on the Biological Effects of Microwave Radiation

This 1971 report referenced more than 2300 research articles listing more than 120 illnesses caused by radio frequency and microwave radiation including damage to the thyroid, blood, reproductive organs, heart and brain in addition to cell mutations.

http://safeschool.ca/uploads/Navy_Radiowave_Brief_1_.pdf

Most cancer in firefighters is due to radio-frequency radiation exposure not inhaled carcinogens

<http://www.sammilham.com/Cancer%20in%20firefighters%20due%20to%20radio-frequency%20exposure.pdf>

Biological effects from electromagnetic field exposure and public exposure standards.

"Health endpoints reported to be associated with ELF and/or RF include childhood leukaemia, brain tumours, genotoxic effects, neurological effects and neurodegenerative diseases, immune system deregulation, allergic and inflammatory responses, breast cancer, miscarriage and some cardiovascular effects." <http://www.ncbi.nlm.nih.gov/pubmed/18242044>

Magnetic-field-induced DNA strand breaks in brain cells of the rat.

"Acute magnetic field exposure increased apoptosis and necrosis of brain cells in the rat." <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241963/>

Single- and double-strand DNA breaks in rat brain cells after acute exposure to radiofrequency electromagnetic radiation.

"An increase in both types of DNA strand breaks was observed after exposure to either the pulsed or continuous-wave radiation" <http://www.ncbi.nlm.nih.gov/pubmed/8627134>

Blood-brain barrier permeability and nerve cell damage in rat brain 14 and 28 days after exposure to microwaves from GSM mobile phones.

"Albumin extravazation and also its uptake into neurons was seen to be enhanced after 14 d (Kruskal Wallis test: $p = 0.02$ and 0.002 , respectively)... The occurrence of dark neurons in the rat brains... was enhanced later, after 28 d ($p = 0.02$). Furthermore, in the 28-d brain samples, neuronal albumin uptake was significantly correlated to occurrence of damaged neurons (Spearman $r = 0.41$; $p < 0.01$)." <http://www.ncbi.nlm.nih.gov/pubmed/18821198>

Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones.

"We found highly significant ($p < 0.002$) evidence for neuronal damage in the cortex, hippocampus, and basal ganglia in the brains of exposed rats." <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241519/?tool=pubmed>

Increased blood-brain barrier permeability in mammalian brain 7 days after exposure to the radiation from a GSM-900 mobile phone.

"The present findings are in agreement with our earlier studies where we have seen increased BBB permeability immediately and 14 days after exposure." <http://www.ncbi.nlm.nih.gov/pubmed/19345073>

Non-thermal DNA breakage by mobile-phone radiation (1800 MHz) in human fibroblasts and in transformed GFSH-R17 rat granulosa cells in vitro Mutation Research/Genetic Toxicology and Environmental Mutagenesis

Volume 583, Issue 2, 6 June 2005, Pages 178-183

"we conclude that the induced DNA damage cannot be based on thermal effects." <http://www.ncbi.nlm.nih.gov/pubmed/15869902>

Electromagnetic fields stress living cells

Martin Blank, Reba Goodman,

Department of Physiology, Columbia University, New York, NY, USA

"While low energy EMF interacts with DNA to induce the stress response, increasing EMF energy in the RF range can lead to breaks in DNA strands. It is clear that in order to protect living cells, **EMF safety limits must be changed** from the current thermal standard, based on energy, to one based on biological responses that occur long before the threshold for thermal changes." <http://www.pathophysiologyjournal.com/article/S0928-4680%2809%2900006-6/abstract>

Evidence that Electromagnetic Radiation is Genotoxic: The implications for the epidemiology of cancer and cardiac, neurological and reproductive effects.

Neil Cherry, Environmental Health, Lincoln University, New Zealand

"Many studies, from independent laboratories, have shown that ELF, RF/MW and cell phone radiation, significantly increases chromosome aberrations in exposed cells, including cells taken from human beings who have been exposed to EMR in occupational situations. Even at very low intensity radar exposures that were experienced at the U.S. Embassy in Moscow, **significant increases in chromosome damage** was measured from human blood samples. This evidence shows conclusively that across the EMR spectrum, EMR is **genotoxic**. Hence it is **carcinogenic and teratogenic**." <http://www.neilcherry.com/documents.php#rf>

Excerpts http://www.vws.org/documents/7Dr.CherryEvidence_000.pdf

Public Health Implications of Wireless Technologies

"**Existing safety standards are obsolete** because they are based solely on thermal effects from acute exposures. The rapidly expanding development of new wireless technologies and the long latency for the development of such serious diseases as brain cancers means that failure to take immediate action to reduce risks may result in an epidemic of potentially fatal diseases in the future."

[http://www.pathophysiologyjournal.com/article/S0928-4680\(09\)00017-0/abstract](http://www.pathophysiologyjournal.com/article/S0928-4680(09)00017-0/abstract)

Genotoxic Effects of Radiofrequency Electromagnetic Fields

"Taking altogether there is ample evidence that RF-EMF can **alter the genetic material** of exposed cells in vivo and in vitro and **in more than one way**." [http://www.pathophysiologyjournal.com/article/S0928-4680\(09\)00016-9/abstract](http://www.pathophysiologyjournal.com/article/S0928-4680(09)00016-9/abstract)

Cognitive impairment in rats after long-term exposure to GSM-900 mobile phone radiation.

"Our results suggest significantly **reduced memory functions** in rats after GSM microwave exposure (P = 0.02)." <http://www.ncbi.nlm.nih.gov/pubmed/18044737>

Dr. Sheila V. Basrur, Medical Officer of Health to Toronto Board of Health Subject: Health Effects of Wireless Telephone Transmission Towers

"Given the degree of uncertainty as to whether exposure levels below those permitted by Safety Code 6 could result in adverse health effects, **Toronto Public Health supports the implementation of a prudent avoidance policy**. Such a policy encourages the adoption of individual or societal actions to **avoid unnecessary exposures** to radio frequencies that entail little or no cost." http://www.toronto.ca/health/hphe/pdf/rf_boh_final.pdf

Cellular phone use and risk of benign and malignant tumours.

American Journal of Epidemiology 167(4), 457-467, 2008.

"Based on the largest number of benign PGT patients reported to date, our results suggest an association between cellular phone use and **PGTs (parotid gland tumours)**."

<http://aje.oxfordjournals.org/cgi/content/abstract/167/4/457>

Mobile phone use and risk of tumors: a meta analysis.

Journal of Clinical Oncology 27(33), 5565-5572, 2009.

"The current study found that there is possible evidence linking mobile phone use to an **increased risk of tumors** from a meta-analysis of low-biased case-control studies."

<https://www.ncbi.nlm.nih.gov/pubmed/19826127>

Cardiovascular risk under electromagnetic exposure.

"The authors concluded that the electromagnetic field exposure of medical staff in physiotherapy could be associated with **adverse effects on the cardiovascular system**."

http://www.emf-portal.de/viewer.php?aid=15833&sid=6f336c7ba112baee42d94bd8c34170ac&sform=6&pag_idx=80&l=e

Radiofrequency-induced carcinogenesis: cellular calcium homeostasis changes as a triggering factor.

"The findings suggest that in exposed animals, **carcinogenesis may be induced earlier** and with different pathological forms than in control mice." http://www.emf-portal.de/viewer.php?aid=12248&sid=f980ebaeb7b9ce8a9a0c808d6d414550&sform=6&pag_idx=30&l=e

Non-thermal activation of the hsp27/p38MAPK stress pathway by mobile phone radiation in human endothelial cells: Molecular mechanism for cancer- and blood-brain barrier-related effects.

"The authors conclude that low energy microwave irradiation may be harmful as it is sufficient to **alter the levels of thyroid hormones** as well as the **emotional reactivity** of rats."

http://www.emf-portal.de/viewer.php?aid=16182&sid=066e46c73a86b30f2c00fed54467f5f4&sform=6&pag_idx=0&l=e

The Effects of Microwave emitted by Cellular Phones on Ovarian Follicles in Rats.

"The **number of pups per delivery** was **significantly decreased** in the exposure group compared to the control group. The data showed that in the pups of the exposed group, the **number of follicles was significantly lower** than that in the control group. The decreased number of follicles in pups exposed to mobile phone microwaves suggest that intrauterine exposure has **toxic effects on ovaries**."

<http://www.scribd.com/doc/33692615/The-Effects-of-MW-Emitted-by-Cell-Phones-on-Murine-Ovarian-Follicles>

http://www.emf-portal.de/viewer.php?aid=16824&sid=a3b8ea65f712333b9931cbf59ffe2df&sform=6&pag_idx=10&l=e

Effects of mobile phone radiation on serum testosterone in Wistar albino rats.

"The data showed that exposure to mobile phones for 60 minutes/day for the total period of 3 months significantly **decreased the serum testosterone** level in rats compared to the control group. Testosterone is a primary male gender hormone and any change in the normal levels may be devastating for reproductive and general health."

http://www.emf-portal.de/viewer.php?aid=18557&sid=066e46c73a86b30f2c00fed54467f5f4&sform=6&pag_idx=0&l=e

http://www.emf-portal.de/viewer.php?aid=18557&sid=066e46c73a86b30f2c00fed54467f5f4&sform=6&pag_idx=0&l=e

Increase of brain ammonia after microwave irradiation and its mechanism.

"The **ammonia concentration** was found about **5 times higher** in animals exposed to 0.4 s than in non or longer exposed animals."

http://www.emf-portal.de/viewer.php?aid=4971&sid=032f7707821b85619c2ea16bf9441d34&sform=6&pag_idx=60&l=e

RF radiation-induced changes in the prenatal development of mice.

By: Magras IN, Xenos TD Published in: Bioelectromagnetics 1997; 18 (6): 455 - 461

"A **progressive decrease in the number of newborns** per dam was found, which ended in **irreversible infertility**."

Melanoma incidence and frequency modulation (FM) broadcasting

"The authors concluded that **melanoma** is associated with exposure to FM broadcasting."

Hallberg Ö, Johansson O, Arch Environ Health 2002; 57: 32-40 <http://www.ncbi.nlm.nih.gov/pubmed/12071358>

Cancer trends during the 20th century

"**Breast, bladder, prostate, lung, colon and cutaneous melanoma cancers** are all associated with each other. Figures 15-17 and ref. 11 relate melanoma to radio-frequency EMF."

"...closing down of public radio transmitters seems to have a strong effect in reducing cancer mortality..."

Hallberg Ö, Johansson O, J Aust Coll Nutr & Env Med 2002; 21: 3-8 <http://www.icems.eu/docs/Johansson.pdf>

Malignant melanoma of the skin – not a sunshine story!

"We conclude that **continuous disturbance of cell repair mechanisms** by body-resonant electromagnetic fields seems to amplify the carcinogenic effects resulting from cell damage caused e.g. by UV-radiation."

Hallberg Ö, Johansson O, Med Sci Monit 2004; 10: CR336-340 <http://www.ncbi.nlm.nih.gov/pubmed/15232509>

Electro hypersensitivity: Observations in the human skin of a physical impairment

"In summary, it is evident from our preliminary data that various **biological alterations** are present in the electrohypersensitive persons claiming to suffer from exposure of electromagnetic fields."

Johansson O, Symposium on 'Electrical Sensitivity in Human Beings', Royal Society of Medicine, London, U.K., September 11, 2004 (abstr.)

<http://www.icems.eu/docs/Johansson.pdf>

Does GSM 1800 MHz affect the public health in Sweden?

"The data shows that the health of the whole **Swedish population is threatened**."

"The responsible authorities must seriously consider possible health implications from the GSM 1800 MHz system"

Hallberg Ö, Johansson O, , In: Proceedings of the 3rd International Workshop 'Biological Effects of EMFs', Kos, Greece, October 4-8, 2004

Johansson O, 'Electro hypersensitivity: Observations in the human skin of a physical impairment', WHO Workshop on 'Electrical Hypersensitivity', Prague, Czech Republic, October 25-27, 2004 (abstr.)

1997 – A curious year in Sweden

Hallberg Ö, Johansson O., Eur J Cancer Prev 2004; 13: 535-538

"We note that 1997 was a very curious year in that a large number of health-related measures suddenly started to indicate a **fast degradation in the health** of the Swedish population. Several health characteristics and diseases seem to **correlate with** the Swedish **introduction of the GSM 1800MHz system both in time and place.**"

Long-term sickness and mobile phone use

"...strong similarity between increased mobile phone use and health degradation in Sweden. Other investigations have shown a **strong correlation between mobile system transmitter coverage and health** including recovery times from accidents and surgery operations. All in all we can only conclude that it is now time to reconsider the benefit of handheld radiating devices, nowadays being marketed also towards innocent children. ... health care expenses likely to be caused by mobile phone and transmitter radiation."

Hallberg Ö, Johansson O, J Aust Coll Nutr & Env Med, 2004; 23: 11-12 <http://www.iddd.de/umtsno/lthhallberg.pdf>

Mobile handset output power and health

"we show that there is a very strong correlation between **health degradation** and weak GSM coverage, while there is no such relation noticed for the time period 1981–1991 when no handset power regulation was applied."

Hallberg Ö, Johansson O, Electromag Biol Med 2004; 23: 229-239
<http://informahealthcare.com/doi/abs/10.1081/JBC-200044239>

FM broadcasting exposure time and malignant melanoma incidence

"Malignant melanoma is an example of a disease that was very rare before 1955 but has increased dramatically over the past 50 years. This increase may be due to an environmental agent which **interferes with cell repair** mechanisms normally active during sleep. We have shown that an environmental change of this type might be the exposure of a population to whole-body resonant EMFs via FM broadcasting transmitters. In Sweden FM broadcasting started in 1955 and had increased considerably by 1957."

Hallberg Ö, Johansson O, , Electromag Biol Med 2005; 24: 1-8
http://www.avaate.org/IMG/pdf/melanoma_electromagneticbiologyandmedicine_2005.pdf

Alzheimer mortality – why does it increase so fast in sparsely populated areas?

"The two factors having the strongest correlation with **decreased health quality** were the estimated average power output from mobile phones (positive correlation) and the reported coverage from the global system for mobile communication base stations (negative correlation) in each county."

<http://www.scribd.com/doc/24980389/Alzheimer-Mortality-%E2%80%93-Why-Does-It-Increase>
http://journals.lww.com/eurjancerprev/Abstract/2007/02000/Adverse_health_indicators_correlating_with_10.aspx

Hallberg Ö, Johansson O, Europ Biol Bioelectromag 2005, in press

Disturbance of the immune system by electromagnetic fields

- **A potentially underlying cause for cellular damage and tissue repair reduction which could lead to disease and impairment** "A number of papers dealing with the effects of modern, man-made electromagnetic fields (EMFs) on the immune system are summarized in the present review. EMFs disturb immune function through stimulation of various allergic and inflammatory responses, as well as effects on tissue repair processes. Such disturbances increase the risks for various diseases, including **cancer**. These and the EMF effects on other biological processes (e.g. **DNA damage, neurological effects**, etc.) are now widely reported to occur at exposure levels significantly below most current national and international safety limits. Obviously, biologically based exposure standards are needed to prevent disruption of normal body processes and potential adverse health effects of chronic exposure." http://www.emrnetwork.org/pdfs/PATPHY_621.pdf

Non-thermal effects in the microwave induced unfolding of proteins observed by chaperone binding.

"We show that microwaves cause a significantly higher degree of unfolding than conventional thermal **stress for protein** solutions heated to the same maximum temperature."

<http://www.ncbi.nlm.nih.gov/pubmed/18240290>

Light and electron microscopic study of the thyroid gland in rats exposed to power-frequency electromagnetic fields

"the results of this study show the stimulative effect of power-frequency EMF on **thyroid gland** at both the light microscope and the ultrastructural level." <http://jeb.biologists.org/cgi/reprint/209/17/3322.pdf>

Wireless Devices, Standards, and Microwave Radiation in the Education Environment

"Until we know beyond the shadow of a doubt that this technology can be safely used by children, we are behaving like irresponsible adults by **treating our children as guinea pigs in this uncontrolled experiment.**"
<http://www.vws.org/documents/14.EMFGaryBrowninEducn.pdf>

Cell Membrane and Electromagnetic Fields

"Electromagnetic field can affect the protein distribution pattern and the proliferation rate of different kind of cells. **Protein clusterization** may induce a change in **cell permeability control.** The evidence of Biological effects are so strong that the icnirp guidelines are to be modified to lower epidemiological limits. Public exposure Limit - To avoid the demonstrated health effects the public, exposure limit should be 0.02 mW/cm²." http://www.salzburg.gv.at/Proceedings_%2813%29_Marinelli.pdf

Rationale for Setting EMF Exposure Standards

(Based on large-scale human studies of 1312 workers and 1859 students in China)

"In summary, the results showed that chronic exposure to EMFs are associated with a variety of non-specific symptoms, including increased frequency of **neuroses, liability of vegetation nervous system, and slight changes in peripheral blood, lens, and non-specific immune function...** The health hazard develops after overpassing of the adaptation/defense processes of the subjects. However, the existence of **health hazardous effects** of RF (*radiofrequency*) and MW (*microwave*) could not be denied.
" http://www.salzburg.gv.at/Proceedings_%2820%29_Chiang.pdf

Comparison of EMF standard and EMF research in China

CAO Zhaojin - National Institute for Environmental Health and Related Product Safety, China 2006

"Epidemiological studies showed that low intensity RF exposure (lower than EMF standard, <10µW/cm²) [*Note: Current Canadian standard is 1000µW/cm²*] might have effects on human **neurobehavior, neurasthenia, cataract, and sperm development; low intensity RF might result in abnormal of ECG, EEG, and rCBF,** and low intensity RF might increase the rate of **mutation and micro nuclei in lymphocytes.** Animal studies showed that RF might have effects on animal **ability of study, memory and male reproduction;** RF might **disturb the elimination ability of free radicals and the regulating ability of brain neurotransmitters.** In vitro studies found that RF might down regulate the cytochrome oxidase activity of neurons and might **damage the retention of brain,** it implies that RF might have some relation with **Alzheimer's dementia.**" <http://www.icems.eu/docs/Cao.pdf>

Electromagnetic Fields produced by Incubators influence Heart Rate Variability in Newborns

C V Bellieni, M Acampa, M Maffei, S Maffei, S Perrone, I Pinto, N Stacchini, G Buonocore

"EMFs produced by incubators influence newborns' HRV, showing an influence on their autonomous nervous system... A reduced HRV is a powerful and independent predictor of adverse prognosis in patients with **heart disease** and in the general population, and the proarrhythmic role exerted by transient or persistent alterations in sympathetic and vagal control mechanisms is well known. Specifically, sympathetic hyperactivity favours the onset of lifethreatening cardiac arrhythmias... newborns should be one case in which a policy of prudent avoidance of an EMF is warranted, perhaps because no study has so far excluded the possibility of negative consequences of their chronic exposition to a high EMF in incubators." <http://www.avaate.org/IMG/pdf/incuvadorafn132738.pdf>

Effects of Cell Phone Radiofrequency Signal Exposure on Brain Glucose Metabolism

"In healthy participants and compared with no exposure, 50-minute cell phone exposure was associated with **increased brain glucose metabolism** in the region closest to the antenna." <http://jama.ama-assn.org/content/305/8/808.short>

Cell Phone Radiofrequency Radiation Exposure and Brain Glucose Metabolism

"the results point to a conclusion that cell phone use can possibly affect **brain function,** and specific effects may depend on the regions of the brain affected." <http://citizensforsafetechnology.org/uploads/scribd/JAMA-2011-Lai-828-9.pdf>

Biological Effects of Mobile Phone Electromagnetic Field on Chick Embryo (risk assessment using the mortality rate)

"Chicken embryos were exposed to EMF from GSM mobile phone during the embryonic development (21 days). As a result the **embryo mortality rate** in the incubation period increased to **75% (versus 16% in control group).**" <http://www.ncbi.nlm.nih.gov/pubmed/14658287>

Tumour risk associated with use of cellular phones or cordless telephones - World Journal of Surgical Oncology 2006

We found for all studied phone types an increased risk for brain tumours, mainly **acoustic neuroma** and **malignant brain tumours.** OR increased with latency period, especially for astrocytoma grade III-IV. <http://www.wjso.com/content/4/1/74>

Lethal And Teratogenic Effects Of Long-Term Low-Intensity Radio Frequency Radiation At 428 Mhz On Developing Chick Embryo

"...for more than 20 days resulted in **embryoethal and/or teratogenic effects** and **delayed hatching.** These adverse biological effects were not

due to any thermal effect of the RF radiation. We have demonstrated teratogenicity in the chick embryo as a result of protracted low-dose RF irradiation." <http://onlinelibrary.wiley.com/doi/10.1002/tera.1420430616/abstract> "Almost one fourth of dead **embryos** in the **radio frequency** group occurred within 10 days after **incubation** and the rest was due to death within the eggshell following **inability to hatch**... A functional **abnormality** consisting of creeping movement and **inability to stand** was found in 89% of **exposed embryos**, but not in the **control** group." http://www.emf-portal.de/viewer.php?aid=2803&sid=aa7d205836c733391828675f0d64d4ae&sform=6&pag_idx=130&l=e

Public health impact of electromagnetic radiation

Journal of the Royal Institute of Public Health, Public Health (2008)

"Considering the **potential long-term danger**, physicians and public health officials should alert individual patients and the public to this issue and provide ongoing information on precautions to diminish potential risk associated with EMF exposure."

http://www.avaate.org/IMG/pdf/Public_Health_-_EMF.pdf

Setting Prudent Public Health Policy for Electromagnetic Field Exposures

http://www.bcuc.com/Documents/Proceedings/2010/DOC_24467_C3-14_McMurtry_Evidence_Prudent-Health-EMF.pdf

Electromagnetic fields and DNA damage- Pathophysiology 2009

http://www.mreengenharia.com.br/pathfisiology/Pathophysiology_2009_H_Lai.pdf

Wireless Radiation in the Etiology and Treatment of Autism: Clinical Observations and Mechanisms - J. Aust. Coll. Nutr. & Env. Med. 2007

http://www.buergerwelle.de/pdf/emr_autism_acnem_final_1.pdf

<http://www.vancouver.sun.com/health/Parents+call+halt+installations+schools+citing+health+concerns/4679368/story.html#comments#ixzz1KqolQrpw>

Cell Phone Radiation on Human Sperm

University of California, Berkeley 2011

"**Eight of the nine original studies reported adverse effects...**"

<http://tinyurl.com/6fgtb4d>

Environmental Medicine- Electromagnetic Fields- Austrian Medical Association 2007

"**Children** and adolescents should use cordless and mobile phones, if at all, in **emergencies only**." <http://www.weepinitiative.org/LINKEDDOCS/scientific/elektrosmog-environmental-medicine-evaluation-2007.pdf>

Electromagnetic fields on cells- Department - Biochemical and Biophysical Research

"We have shown that this coherent vibration of electric charge is able to irregularly gate electrosensitive channels on the plasma membrane and thus cause **disruption of the cell's electrochemical balance and function**."

http://kyttariki.biol.uoa.gr/mobile_phones/article-2002.pdf

Brain-tumour risk in mobile-phone

Occupational and Environmental Medicine 2011

http://www.avaate.org/IMG/pdf/CardisOccup_Environ_Med-2011-Cardis-oem.2010.061358_2_.pdf

American Academy of Pediatrics, 2005

Concerns about the potential **vulnerability of children to radio frequency** (RF) fields have been raised because of the potentially greater susceptibility of their developing nervous systems; in addition, their brain tissue is more conductive, RF penetration is greater relative to head size, and they will have a longer lifetime of exposure than adults.

<http://www.rebprotocol.net/November2007/The%20sensitivity%20of%20children%20to%20electromagnetic%20fields%20Kheifets%20etal%202006%2013pp.pdf>

Pathophysiology of cell phone radiation- Reproductive Biology and Endocrinology 2009

<http://www.springerlink.com/content/235547qg0vww237n/fulltext.pdf>

Mutagenic response of 2.45 GHz radiation- International Journal Radiation Biology

<http://www.kawarthasafetechnology.org/wp-content/uploads/2011/03/RatBrainEMFExposureStudyApr2010.pdf>

Pulsed 2.4 GHz Radiation - Biological Effects 2002

http://www.magdahavas.com/wordpress/wp-content/uploads/2010/10/dect_study.pdf

Effects of Cell Phone - Brain Glucose Metabolism-American Medical Association, 2011

<http://jama.ama-assn.org/content/305/8/808.short>

Effects from cellular phones on human ejaculated semen- Reproductive Medicine, 2009

[http://www.fertstert.org/article/S0015-0282\(08\)03356-6/abstract](http://www.fertstert.org/article/S0015-0282(08)03356-6/abstract)

<http://www.vancouver.sun.com/health/Parents+call+halt+installations+schools+citing+health+concerns/4679368/story.html#comments#ixzz1KqoUnXih>

Tumour risk associated with use of cellular phones or cordless telephones - World Journal of Surgical Oncology 2006,

<http://www.wjso.com/content/4/1/74>

Public health impact of electromagnetic radiation Journal of the Royal Institute of Public Health, Public Health 2008,

http://www.avaate.org/IMG/pdf/Public_Health_-_EMF.pdf

Setting Prudent Public Health Policy for Electromagnetic Field Exposures

http://www.bcuc.com/Documents/Proceedings/2010/DOC_24467_C3-14_McMurtry_Evidence_Prudent-Health-EMF.pdf

Electromagnetic fields and DNA damage- Pathophysiology 2009

http://www.mreengenharia.com.br/pathfisiology/Pathophysiology_2009_H_Lai.pdf

The Effects of Microwave emitted by Cellular Phones on Ovarian Follicles in Rats

"...the number of follicles was lower than that in the control group. The decreased number of follicles in pups exposed to mobile phone microwaves suggest that intrauterine exposure has toxic effects on ovaries. Conclusion: We suggest that the microwaves of mobile phones might decrease the number of follicles in rats by several known and, no doubt, countless unknown mechanisms. "

<http://www.scribd.com/doc/33692615/The-Effects-of-MW-Emitted-by-Cell-Phones-on-Murine-Ovarian-Follicles>

Report on Cell Tower Radiation

Department of Telecommunication, Delhi, India

Prepared by Prof. Girish Kumar gkumar@ee.iitb.ac

Electrical Engineering Department IIT Bombay, Powai, Mumbai – 400 076 - December 2010

"Let's do some simple calculation of how much microwave power will be absorbed by human body if exposed to the so called safe radiation level adopted in India of power density = 4.7W/m² for GSM900 band.. If we model human body as a cylinder, then its area will be 1.436square meter (average height 5'6" = 1.67 m and waist 34" = 86 cm). So, power recd. by human body will be power density x area = 6.75 Watts. In one hour, microwave energy absorbed will be 6.75 x 3600 = 24.3 KW-sec. In one day, microwave energy absorbed will be 24.3 x 24 = 583.2KW-sec. A typical microwave oven has a rating of 700 to 1000 W, and with say 60% efficiency, microwave power output is approximately 500 W. This implies that human body can be safely kept in a microwave oven for 583.2 KW-sec / 500 W = 1166 seconds = 19 minutes per day. How many people in the world are willing to put themselves, their family members, and their unborn children in an open microwave oven for 19 minutes/day? Telecom providers or policy maker scan argue about body being adaptable to external threats and the radiation is spread over whole day. However, question remains, would we like to put our citizens in an open microwave oven for 19 minutes/day over the years. Also, this is only for a single source. For multiple sources, it will increase correspondingly. Thus, the safe limit adopted by India is extremely high and millions of people are suffering because of this."

(Note: Canadian standard is 10W/m² which is more than twice the exposure limit of India.)

Conclusion: "The seriousness of the health hazards due to radiation from the cell phones and cell towers has not been realized among the common man. Cell operators continue to claim that there are no health issues. Even organizations like WHO, ICNIRP, FCC, etc. have not recommended stricter safe radiation guidelines, whereas several countries have adopted radiation norms, which are 1/100th to 1/1000th of these values based on their studies. Cell phone industry is becoming another cigarette industry, which kept claiming that smoking is not harmful and now there are millions of people around the world who have suffered from smoking. In fact, cell phone/tower radiation is worse than smoking; as one cannot see it or smell it, and its effect on health is noted after a long period of exposure.... Unfortunately, ignorance and non-awareness adds to this misery and all of us are absorbing this slow poison unknowingly. Even if people are aware of the radiation hazard, they may not have the choice to move away from it if the tower is installed near their office or residential building. In addition to the continuous radiation from cell towers, there is radiation from cell phones, wireless phones, computers, laptops, TV towers, FM towers, AM

towers, microwave ovens, etc. We are exposed to all these radiations which are additive in nature. Hence, it is imperative that stricter radiation norms must be enforced by the policy makers... If people in the mobile companies think there is no health hazard, then let them stand in front of their own transmitting tower at 1m distance in the main beam for 6 hours – are they willing to take the risk? Similar effect will be there at 10m distance in about 600 hours (25 days). If mobile companies accept that radiation causes serious health problems... then researchers/technocrats/entrepreneurs will come out with possible solutions, which may be expensive but that cannot be greater than the health risk faced by humans, birds, animals and environment."

<http://tinyurl.com/3tc8nt6>

Cell phone use and behavioural problems in young children.

"The results showed positive associations between cell phone use and behavioural problems in young children. The highest odds ratios for behavioural problems were for children who had both prenatal and postnatal exposure to cell phones compared with children not exposed during either time period (OR 1.5, CI 1.4-1.7). The findings of the previous study by Divan et al (2008) were replicated in a separate group of participants demonstrating that cell phone use was associated with behavioural problems at the age of 7 years in children."

<http://www.emf-portal.de/viewer.php?aid=18825&l=e>
<http://www.independent.co.uk/life-style/health-and-families/health-news/warning-using-a-mobile-phone-while-pregnant-can-seriously-damage-your-baby-830352.html>

Exposure to radio-frequency electromagnetic fields and behavioural problems in Bavarian children and adolescents.

An analysis of the behaviour subgroups showed an association between the highest exposure group and conduct problems for adolescents and for children.

<http://www.emf-portal.de/viewer.php?aid=17774&l=e>

Analyzing the Health Impacts of Modern Telecommunications Microwaves.

"In the present study we showed that microwave radiations used in modern mobile telecommunications can damage DNA and induce cell death or heritable mutations which may in turn result in reproduction decreases, degenerative diseases, or cancer."

<http://www.citizensforsafetechnology.org/Analysing-the-Health-Impacts-of-modern-telecommunications-microwaves.2,376>

Non-Thermal Effects And Mechanisms Of Interaction Between Electromagnetic Fields And Living Matter

National Institute for the Study and Control of Cancer and Environmental Diseases "Bernardino Ramazzini" Bologna, Italy 2010

http://www.icems.eu/papers/ramazzini_library5_part1.pdf

2011 International Association of Fire Fighters' Position on the Health Effects from Radio Frequency/Microwave (RF/MW) Radiation in Fire Department Facilities

"There are established biological effects from exposure to low-level RF/MW radiation. Such biological effects are recognized as markers of adverse health effects when they arise from exposure to toxic chemicals..."

<http://www.iaff.org/hs/Facts/CellTowerFinal.asp#ref23>

The Bioinitiative Report

Review of over 2,000 scientific studies on electromagnetic fields, by independent (non-industry-funded) scientists.

<http://www.bioinitiative.org/freeaccess/report/index.htm>

Cell phones and brain tumors: a review including the long-term epidemiologic data

"The results indicate that using a cell phone for ≥ 10 years approximately doubles the risk of being diagnosed with a brain tumor on the same ("ipsilateral") side of the head as that preferred for cell phone use. The data achieve statistical significance for glioma and acoustic neuroma..." <http://tinyurl.com/3cgp4e4>

Electromagnetism & Life

"Soviet investigators reported that electromagnetic energy could affect the central nervous, cardiovascular, and endocrine systems... led to the adoption of a 10 μ W rule for the workplace and a 1 μ W rule for the general environment... The evidence now shows, overwhelmingly, that the Soviet approach was the correct one... Man-made EMFs are present in the environment at levels shown by experiment to be capable of affecting biological function. It follows, therefore, that uncontrolled exposure to such EMFs is a potential public health risk. The regulatory response to the environmental EMF problem has been slow, and the nature of the proof demanded has frequently been inappropriate."

<http://www.rebprotocol.net/November2007/Robert%20.%20Becker%20and%20Andrew%20A.%20Marino%201982%20Electromagnetism%20and%20life%20156pp.pdf>

Effects of Laptop Computers' Electromagnetic Field on Sperm Quality

"...magnetic fields induced by laptop computers may decrease sperm count and sperm motility, ultimately affecting male reproductive capabilities. It is advisable to limit the time these devices are used in a laptop position."

<http://www.jri.ir/en/ShowArticle.aspx?id=425>

Fetal Radiofrequency Radiation Exposure From 800-1900 Mhz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice

"Here we demonstrate that fetal exposure to 800–1900 Mhz-rated radiofrequency radiation from cellular telephones leads to behavioral and neurophysiological alterations that persist into adulthood...The significant trend between the groups treated for 0, 9, 15, and 24 hours/day demonstrates that the effects are directly proportional to usage time..."

<http://www.nature.com/srep/2012/120315/srep00312/full/srep00312.htm>

Exposure to Electromagnetic Fields From Laptop Use of "Laptop" Computers

"In the LTCs analyzed, EMF values (range 1.8–6

µT) are within International Commission on Non-Ionizing Radiation (NIR) Protection (ICNIRP) guidelines, but are considerably higher than the values recommended by 2 recent guidelines for computer monitors magnetic field emissions, MPR II (Swedish Board for Technical Accreditation)

and TCO (Swedish Confederation of Professional Employees), and those considered risky for tumor development... the power supply induces strong intracorporal electric current densities in the fetus and in the adult subject, which are respectively 182–263% and 71–483% higher than ICNIRP 98 basic restriction recommended to prevent adverse health effects."

https://docs.google.com/open?id=17Z-BgRE0Ib-YtEnGFLLO5dmOgrudovBj8mfHLFrzzFkLkZiwV1Lmth_Ttxl

Electromagnetic hypersensitivity: Fact or fiction?

Recent evidence in the scientific literature suggests that various objective physiological alterations are apparent in some EHS persons claiming to suffer after exposure to certain frequencies of EMR (McCarty et al., 2011; Havas et al., 2010). As a result, many scientists now recognize that hypersensitivity to EMR can be a debilitating medical condition that is affecting increasing numbers of people throughout the world.

https://docs.google.com/open?id=1G92xdR2UF6nV_RGvE2B4da7ziPluxkFSUghWV1mGdmnGDI0ZTfg-6RUexvI

Psychophysiological Indicators for Child Users of Mobile Communication. Message 1: Present State of the Problem

Message 2: Results of Four-year Monitoring

"It has been shown that the children's organism is more sensitive to this kind of exposure than the adult one. We have identified the following major trends of the psychophysiological indicators for child users of mobile communication: an increased number of phonemic perception disorders, abatement of efficiency, reduced indicators for the arbitrary and semantic memory, and increased fatigue. A steady decline of the parameters from high values to bottom standards has been found."

<http://electromagnetichealth.org/electromagnetic-health-blog/russian-res-children-emf/>

Are Autism Spectrum Conditions More Prevalent in an Information-Technology Region? A School-Based Study of Three Regions in the Netherlands

Autism Research Centre, Department of Psychiatry, University of Cambridge, UK

Department of Life Sciences, The Open University, Milton Keynes, UK

Department of Public Health and Primary Care, Institute of Public Health, University of Cambridge, UK

MRC Biostatistics Unit, Institute of Public Health, UK

University Surgical Unit, Southampton General Hospital, Southampton, UK

"Our study suggests a two- to four-fold higher ASC [Autism spectrum conditions] rate in the Eindhoven region ["known for their high tech (IT-rich) employment rates"], whilst the prevalence of ADHD and dyspraxia were similar in the three regions."

<https://www.ncbi.nlm.nih.gov/pubmed/21681590>

Effects of exposure to 2.45 GHz microwave radiation on male rat reproductive system.

"Conclusion: MW radiation exposures caused reduction in sperm counts and motility and increased the proportion of abnormal sperm cells and induced reduction in sperm count and motility while increasing the proportion of abnormal sperm cells."

<http://www.journalcra.com/?q=node/380>

Cell Phone Radiation on Human Sperm

University of California, Berkeley 2011

"Eight of the nine original studies reported adverse effects..." <http://tinyurl.com/6fgtb4d>

Effects of Laptop Computers' Electromagnetic Field on Sperm Quality

"...magnetic fields induced by laptop computers may decrease sperm count and sperm motility, ultimately affecting male reproductive capabilities. It is advisable to limit the time these devices are used in a laptop position." <http://www.jri.ir/en/ShowArticle.aspx?id=425>

Mobile Phone Mast Effects on Common Frog (Rana temporaria) Tadpoles: The City Turned into a Laboratory

"In the exposed group, low coordination of movements, an asynchronous growth, resulting in both big and small tadpoles, and a high mortality (90%) was observed. Regarding the control group (n ¼ 70) under the same conditions but inside a Faraday cage, the coordination of movements was normal, the development was synchronous, and a mortality of 4.2% was obtained."

http://citizensforsafetechnology.org/uploads/balmori_city_as_lab1.pdf

RF radiation-induced changes in the prenatal development of mice.

By: Magras IN, Xenos TD Published in: Bioelectromagnetics 1997; 18 (6): 455 - 461

"A progressive decrease in the number of newborns per dam was found, which ended in irreversible infertility."

Analyzing The Health Impacts Of Modern Telecommunications Microwaves

"The effect of cell death induction in the developing eggs of the exposed female insects, just like the corresponding effect on the reproductive capacity... evident for distances up to 100 cm (radiation intensities down to 1 µW/cm²)."

<http://www.citizensforsafetechnology.org/uploads/scribd/Panagopoulos-Nova-2011-Adv%20Med%20Biol-review-chapter.pdf>

Lethal And Teratogenic Effects Of Long-Term Low-Intensity Radio Frequency Radiation At 428 Mhz On Developing Chick Embryo

"...for more than 20 days resulted in embryolethal and/or teratogenic effects and delayed hatching. These adverse biological effects were not due to any thermal effect of the RF radiation. We have demonstrated teratogenicity in the chick embryo as a result of protracted low-dose RF irradiation." <http://onlinelibrary.wiley.com/doi/10.1002/tera.1420430616/abstract> "Almost one fourth of dead embryos in the radio frequency group occurred within 10 days after incubation and the rest was due to death within the eggshell following inability to hatch... A functional abnormality consisting of creeping movement and inability to stand was found in 89% of exposed embryos, but not in the control group." [http://www.emf-portal.de/viewer.php?](http://www.emf-portal.de/viewer.php?aid=2803&sid=aa7d205836c733391828675f0d64d4ae&sform=6&pag_idx=130&l=e)

[aid=2803&sid=aa7d205836c733391828675f0d64d4ae&sform=6&pag_idx=130&l=e](http://www.emf-portal.de/viewer.php?aid=2803&sid=aa7d205836c733391828675f0d64d4ae&sform=6&pag_idx=130&l=e)

Possible Effects of Electromagnetic Fields from Phone Masts on a Population of White Stork (Ciconia ciconia).

Balmori Alfonso (2005). Electromagnetic Biology and Medicine, 24: 109-119

"Total productivity (number of young per couple, including nests with 0 chicks) for nests within 200m of the antenna was 0.86 (0.7 - 1.02), whereas productivity for nests further than 300m away was 1.6 (1.46- 1.74). Both were statistically significant, with a p value of 0.001. A large part of the difference here appears to be due to the likelihood of the couples in the nests near the mast (cell tower) not having any chicks: 40% of those within 200m had no chicks, whereas in the nests greater than 300m away only 3.3% did not have chicks! Odd behaviour was also noted in the storks, happening much more frequently the closer the nests were to the masts."

http://www.powerwatch.org.uk/news/20051006_storks.asp

The Effects of Microwave emitted by Cellular Phones on Ovarian Follicles in Rats.

"The number of pups per delivery was significantly decreased in the exposure group compared to the control group. The data showed that in the pups of the exposed group, the number of follicles was significantly lower than that in the control group. The decreased number of follicles in pups exposed to mobile phone microwaves suggest that intrauterine exposure has toxic effects on ovaries."

<http://www.scribd.com/doc/33692615/The-Effects-of-MW-Emitted-by-Cell-Phones-on-Murine-Ovarian-Follicles>

http://www.emf-portal.de/viewer.php?aid=16824&sid=a3b8ea65f712333b9931cbf59fffe2df&sform=6&pag_idx=10&l=e

Effects of 2.45 GHz microwaves on meiotic chromosomes of male CBA/CAY mice.

"The findings are interpreted to indicate interference with normal spermatogenesis during the exposure period."

<http://jhered.oxfordjournals.org/content/76/1/71.short>

Effects of microwave at 2.45 GHz radiations on reproductive system of male rats.

"Chronic exposure to these radiations produced **formation of apoptotic cells in testis**. In addition, a significant decrease in the levels of GPx, and SOD activities as well as an increase in CAT activity was observed in the exposed group. These results indicate that a low level exposure of microwave radiations exerts a **negative impact on male reproductive system function**." <http://www.informaworld.com/smpp/content~content=a922592632~db=all~jumptype=rss>

Wi-Fi – A Thalidomide in the Making. Who Cares? September 2013

With Deference to all Scientists: this Research Report has been written for all students and non-scientists to understand.

[ealth/scientific_committees/emerging/docs/emf_117.pdf](#)

Biological Effects of Mobile Phone Electromagnetic Field on Chick Embryo (risk assessment using the mortality rate)

"Chicken embryos were exposed to EMF from GSM mobile phone during the embryonic development (21 days). As a result the **embryo mortality rate** in the incubation period increased to **75% (versus 16% in control group)**." <http://www.ncbi.nlm.nih.gov/pubmed/14658287>

Pathophysiology of cell phone radiation. *Reproductive Biology and Endocrinology* 2009 Desai, N.R., Kesari, K.K. & Agarwal, A. *Reprod Biol Endocrinol* (2009) 7: 114. <https://doi.org/10.1186/1477-7827-7-114>

"We have reviewed the literature to better understand the effects of cell phone radiation on human health, especially on fertility and in relation to cancer. Commercially available cellular phones might affect cell function via non-thermal effects. We hypothesized that the plasma membrane might be the target of cell phone radiation. RF-EMW can increase ROS formation by increasing the activity of plasma membrane NADH oxidase. Prolonged exposure to RF-EMW can also cause **DNA damage** (by prolonged OS), which may accelerates neuronal and spermatozoal cell death and promote **neurodegenerative processes** as well as promote **brain and testicular carcinogenesis**. Any tumor promoting effects of RF-EMW might be due to the effect it has on PKC, ODC, intra cellular calcium spikes and stimulation of stress kinase. Stimulation of plasma membrane NADH oxidase might play central role in above mentioned effects.

OS and changes in PKC activity might lead to the RF-EMW related **infertility** observed in numerous studies. Hence, RF-EMW from commercially available cell phones might affect the fertilizing potential of spermatozoa. Therefore, the **SAR limit (maximum acceptable exposure limit) should be lowered for cellular phones**. However, more studies are necessary to provide definitive evidence against cell phone radiation, which can be provided by in vitro studies combined with computational biomodeling." <http://www.springerlink.com/content/235547qg0vww237n/fulltext.pdf>

Effects from cellular phones on human ejaculated semen. *Reproductive Medicine*, 2009

[http://www.fertstert.org/article/S0015-0282\(08\)03356-6/abstract](http://www.fertstert.org/article/S0015-0282(08)03356-6/abstract)

<http://www.vancouversun.com/health/Parents+call+halt+installations+schools+citing+health+concerns/4679368/story.html#comments#xzz1KqoUnXih>

Radiofrequency radiations induced genotoxic and carcinogenic effects on chickpea (*Cicer arietinum* L.) root tip cells. *Saudi Journal of Biological Sciences*. Published online Feb 11, 2017. Qureshi ST, Memon SA, Abassi AR, Sial MA, Bughio FA.

"It is concluded that radiofrequency radiations are **genotoxic** as they **induced chromosomal aberrations** in chickpea mitotic cells and the presence of ghost cells is clear indication of their carcinogenic potential. To avoid reported DNA damages in this work cell phones should always be used either for short duration or with hands-free for long duration and they should not be kept in pockets or near body. Laptops should not be used unnecessarily for enjoyment purpose. It must be placed on desk top rather lap to minimize their exposure to human body. Further assay of carcinogenicity are recommended on mouse and human cell lines.

<http://www.sciencedirect.com/science/article/pii/S1319562X16000589>