

# Research Studies on the EMF Connection With Human Testicular Cancer, Damaged Sperm and Reduced Fertility compiled by Powerwatch (U.K.), Leading Experts in Electromagnetic Fields.

**Agarwal A, Desai NR, Makker K, Varghese A, Mouradi R, Sabanegh E, Sharma R, Effects of radiofrequency electromagnetic waves (RF-EMW) from cellular phones on human ejaculated semen: an in vitro pilot study, Fertil Steril. 2009 Oct; 92(4):1318-25 <http://www.ncbi.nlm.nih.gov/pubmed/18804757>**  
Radiofrequency electromagnetic waves emitted from cell phones may lead to oxidative stress in human semen. We speculate that keeping the cell phone in a trouser pocket in talk mode may negatively affect spermatozoa and impair male fertility.

**Agarwal A, Deepinder F, Sharma RK, Ranga G, Li J. Effect of cell phone usage on semen analysis in men attending infertility clinic: an observational study, Fertil Steril. 2008 Jan; 89(1):124-128. <http://www.ncbi.nlm.nih.gov/pubmed/17482179>** 361 men attending an infertility clinic were divided into four groups according to their active cell phone use: no use; <2 h/day; 2-4 h/day; >4 h/day. The comparisons of mean sperm count, motility, viability, and normal morphology among four different cell phone user groups were statistically significant. Mean sperm motility, viability, and normal morphology were significantly different in cell phone user groups within two sperm count groups. The laboratory values of the above four sperm parameters decreased in all four cell phone user groups as the duration of daily exposure to cell phones increased. CONCLUSIONS: Use of cell phones decrease the semen quality in men by decreasing the sperm count, motility, viability, and normal morphology. The decrease in sperm parameters was dependent on the duration of daily exposure to cell phones and independent of the initial semen quality.

**J.G. Yan, M. Agresti, T. Bruce, Y.H. Yan, A. Granlund, H.S. Matloub, Effects of cellular phone emissions on sperm motility in rats, Fertil. Steril. 88 (2007) 957-964. <http://www.ncbi.nlm.nih.gov/pubmed/17628553>**  
Rats exposed to 6 hours of daily cellular phone emissions for 18 weeks exhibited a significantly higher incidence of sperm cell death than control group rats. In addition, abnormal clumping of sperm cells was present in rats exposed to cellular phone emissions and was not present in control group rats. These results suggest that carrying cell phones near reproductive organs could negatively affect male fertility.

**Wdowiak A, Wdowiak L, Wiktor H. Evaluation of the effect of using mobile phones on male fertility, Ann Agric Environ Med. 2007;14(1):169-72 <http://www.ncbi.nlm.nih.gov/pubmed/17655195>**  
In the analysis of the effect of GSM mobile phones on the semen of 205 male users it was noted that an increase in the percentage of sperm cells of abnormal morphology is associated with the duration of exposure to the waves emitted by the GSM phone. It was also confirmed that a decrease in the percentage of sperm cells in vital progressing motility in the semen is correlated with the frequency of using mobile phones.

**Erogul, E. Oztas, I. Yildirim, T. Kir, E. Aydur, G. Komesli, H.C. Irkilata, M.K. Irmak, A.F. Peker, Effects of electromagnetic radiation from a cellular phone on human sperm motility: an in vitro study, Arch. Med. Res. 37 (2006) 840-843. <http://www.ncbi.nlm.nih.gov/pubmed/16971222>**  
EMR exposure caused a subtle statistically significant decrease in the rapid progressive and slow progressive sperm movement. It also caused an increase in the no-motility category of sperm movement. There was no statistically significant difference in the sperm concentration between two groups. In addition to these acute adverse effects of EMR on sperm motility, long-term EMR exposure may lead to behavioral or structural changes of the male germ cell. These effects may be observed later in life, and they are to be investigated more seriously.

**Desai NR, Kesari KK, Agarwal A, Pathophysiology of cell phone radiation: oxidative stress and carcinogenesis with focus on male reproductive system, *Reprod Biol Endocrinol.* 2009 Oct 22; 7:114**  
<http://www.ncbi.nlm.nih.gov/pubmed/19849853> The effects of RF-EMW on plasma membrane structures (i.e. NADH oxidase, phosphatidylserine, ornithine decarboxylase) and voltage-gated calcium channels are discussed. We explore the disturbance in reactive oxygen species (ROS) metabolism caused by RF-EMW and delineate NADH oxidase mediated ROS formation as playing a central role in oxidative stress (OS) due to cell phone radiation (with a focus on the male reproductive system).

**De Iuliis GN, Newey RJ, King BV, Aitken RJ. Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro, *PLoS One.* 2009 Jul 31; 4(7):e6446**  
<http://www.ncbi.nlm.nih.gov/pubmed/19649291> RF-EMR in both the power density and frequency range of mobile phones enhances mitochondrial reactive oxygen species generation by human spermatozoa, decreasing the motility and vitality of these cells while stimulating DNA base adduct formation and, ultimately DNA fragmentation. These in-vitro findings have clear implications for the safety of extensive mobile phone use by males of reproductive age, potentially affecting both their fertility and the health and wellbeing of their offspring.

**Fejes, Z. Závaczki, J. Szöllösi, S. Koloszar, J. Daru, L. Kovacs, A. Pál, Is there a relationship between cell phone use and semen quality? *Arch. Androl.* 51 (2005) 385–393.**  
<http://www.ncbi.nlm.nih.gov/pubmed/16087567> A total of 371 male fertility cases were included in the study. The duration of possession and the daily transmission time correlated negatively with the proportion of rapid progressive motile sperm and positively with the proportion of slow progressive motile sperm. The low and high exposed groups also differed in the proportion of rapid progressive motile sperm (48.7% vs. 40.6%). The prolonged use of cell phones may have negative effects on the sperm motility characteristics.

**Mailankot M, Kunnath AP, Jayalekshmi H, Koduru B, Valsalan R. Radio frequency electromagnetic radiation (RFEMR) from GSM (0.9/1.8GHz) mobile phones induces oxidative stress and reduces sperm motility in rats, *Clinics (Sao Paulo).* 2009; 64(6):561-5**  
<http://www.ncbi.nlm.nih.gov/pubmed/19578660> One hour of exposure to the phone did not significantly change facial temperature in either group of rats. Rats exposed to RF-EMR exhibited a significantly reduced percentage of motile sperm. Moreover, RF-EMR exposure resulted in a significant increase in lipid peroxidation and low GSH content in the testis and epididymis. We speculate that RF-EMR from mobile phones negatively affects semen quality and may impair male fertility.

**Aitken RJ, Bennetts LE, Sawyer D, Wiklendt AM, King BV. Impact of radio frequency electromagnetic radiation on DNA integrity in the male germline, *Int. J. Androl.* 28 (2005) 171–179.**  
<http://www.ncbi.nlm.nih.gov/pubmed/15910543> Gel electrophoresis revealed no gross evidence of increased single- or double-DNA strand breakage in spermatozoa taken from treated animals. However, a detailed analysis of DNA integrity using QPCR revealed statistically significant damage to both the mitochondrial genome ( $p < 0.05$ ) and the nuclear beta-globin locus ( $p < 0.01$ ). This study suggests that while RFEMR does not have a dramatic impact on male germ cell development, a significant genotoxic effect on epididymal spermatozoa is evident and deserves further investigation.

**Hardell L, Carlberg M, Ohlson CG, Westberg H, Eriksson M, Hansson Mild K. Use of cellular and cordless telephones and risk of testicular cancer. *Int J Androl.* 2007 Apr;30(2):115-22.**  
<http://www.ncbi.nlm.nih.gov/pubmed/17209885> Non-significant ORs of between 1.1 and 1.3 were found for seminomas but there was no dose-response effect and OR did not increase with latency time.

**Otitolaju AA, Obe IA, Adewale OA, Otubanjo OA, Osunkalu VO. Preliminary study on the induction of sperm head abnormalities in mice, *Mus musculus*, exposed to radiofrequency radiations from global system for mobile communication base stations,** <http://www.ncbi.nlm.nih.gov/pubmed/19816647> The exposure of male mice to radiofrequency radiations from mobile phone (GSM) base stations at a workplace complex and residential quarters caused 39.78 and 46.03%, respectively, in sperm head abnormalities compared to 2.13% in control group. Statistical analysis of sperm head abnormality score showed that there was a significant ( $p < 0.05$ ) difference in occurrence of sperm head abnormalities in test animals. The major abnormalities observed were knobbed hook, pin-head and banana-shaped sperm head. The occurrence of the sperm head abnormalities was also found to be dose dependent. The implications of the observed increase occurrence of sperm head abnormalities on the reproductive health of humans living in close proximity to GSM base stations were discussed.

**Falzone N, Huyser C, Becker P, Leszczynski D, Franken DR. The effect of pulsed 900-MHz GSM mobile phone radiation on the acrosome reaction, head morphometry and zona binding of human spermatozoa,** *Int J Androl.* 2011 Feb;34(1):20-6 <http://www.ncbi.nlm.nih.gov/pubmed/20236367> This study concludes that although RF-EMF exposure did not adversely affect the acrosome reaction, it had a significant effect on sperm morphometry. In addition, a significant decrease in sperm binding to the hemizona was observed. These results could indicate a significant effect of RF-EMF on sperm fertilization potential.

**Ye LL, Suo YS, Cao WL, Chen M. Radar radiation damages sperm quality, *Zhonghua Nan Ke Xue,* 2007 Sep;13(9):801-3,** <http://www.ncbi.nlm.nih.gov/pubmed/17929556>

348 infertile seamen were divided into 4 experimental groups according to their different lengths of exposure to radar radiation. Compared with the normal control, sperm concentration, sperm motility and the percentage of grade a sperm were significantly lower ( $P < 0.01$ ), and the percentages of grade d and abnormal sperm significantly higher ( $P < 0.01$ ) in the experimental groups. CONCLUSION: Radar radiation damages sperm quality, as shown in the reduction of sperm motility and elevation of sperm abnormality.

**Meo SA, Al-Drees AM, Husain S, Khan MM, Imran MB. Effects of mobile phone radiation on serum testosterone in Wistar albino rats, *Saudi Med J.* 2010 Aug;30(8):869-73.** <http://www.ncbi.nlm.nih.gov/pubmed/20714683>

Exposure to mobile phone radiation for 60 minutes/day for the total period of 3 months significantly decrease the serum testosterone level [ $p=0.028$ ] in Wistar Albino rats compared to their matched control. CONCLUSION: Long-term exposure to mobile phone radiation leads to reduction in serum testosterone levels. Testosterone is a primary male gender hormone and any change in the normal levels may be devastating for reproductive and general health.

**Salama N, Kishimoto T, Kanayama HO, Kagawa S. Effects of exposure to a mobile phone on sexual behavior in adult male rabbit: an observational study, *Int J Impot Res.* 2010 Mar; 22(2):127-33** <http://www.ncbi.nlm.nih.gov/pubmed/19940851>

The animals of the phone group were exposed to MPs (800 MHz) in a standby position for 8 h daily for 12 weeks. At the end of the study, the copulatory behavior and hormonal assays were re-evaluated. Mounts without ejaculation were the main mounts in the phone group and its duration and frequency increased significantly compared with the controls, whereas the reverse was observed in its mounts with ejaculation. Ejaculation frequency dropped significantly, biting/grasping against teasers increased notably and mounting latency in accumulated means from the first to the fourth teasers were noted in the phone group. The hormonal assays did not show any significant differences between the study groups. Therefore, the pulsed radiofrequency emitted by a conventional MP, which was kept on a standby position, could affect the sexual behavior in the rabbit.