

EM Radiation Trust, Powerwatch and Electromagnetic Man

The Evidence connecting Mobile Phone EMF Exposure and Male Infertility

by

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Introduction

Data from around the world indicate that about 35% of women and 45% of men are sub-fertile (about 7% of women and men are effectively infertile)^[1,2]. Though most men believe infertility is due to “*female issues*”, the truth is that male infertility plays a role in about 50% of cases of failing to conceive after one year.

Sperm counts in men worldwide have declined by half over the past 50 years and are continuing to fall, according to a number of studies. A 2011 Finnish study of the sperm counts of 858 young men in three birth-year cohorts from the 1970s to the 1980s concluded: **“These simultaneous and rapidly occurring adverse trends suggest that the underlying causes are environmental and, as such, preventable.”** The decrease could be due to environmental chemicals affecting early testicular development and/or to the increased EMF exposure from cell phones. Lifestyle factors are likely to be having a significant impact. The more recently a male was born then the lower their sperm count is likely to be when they reach 20^[3]

What affects sperm and male fertility?

It is well established that smoking and drinking, drugs (medicinal and recreational), hormone-affecting chemicals in our food and environment, and increasing testicular temperature can adversely affect sperm count.

There is also growing evidence that electromagnetic fields (EMF) from cell phones can impair male fertility. If the observed association between cell phone EMF exposure and reduced sperm counts proves to be causal, then the dramatic increase in mobile phone use, especially by young people, over the last two decades could be the major factor.

A recent (July 2011) peer-review published scientific paper over-view of the scientific literature concluded^[4]: “The use of mobile phones is now widespread. A great debate is going on about the possible damage that the radiofrequency electromagnetic radiation (RF-EMR) emitted by mobile phones exerts on different organs and apparatuses. In human beings, two different experimental approaches have been followed, one has explored the effects of RF-EMR directly on spermatozoa and the other has evaluated the sperm parameters in men using or not mobile phones. **The results show that human spermatozoa exposed to RF-EMR have decreased motility, morphometric abnormalities, and increased oxidative stress, whereas men using mobile phones have decreased sperm concentration, motility (particularly the rapid progressive one), normal morphology, and viability. These abnormalities seem to be directly related with the length of mobile phone use.”**

RF Radiation Damages Spermatozoa

Since the 1940s, researchers have recognized that high-level occupational exposure to radio-frequency (RF) radiation significantly decreases male fertility. More recently, a number of studies have shown that much lower levels of RF radiation, such as that emitted by a cell phone, can also affect sperm quantity and quality.

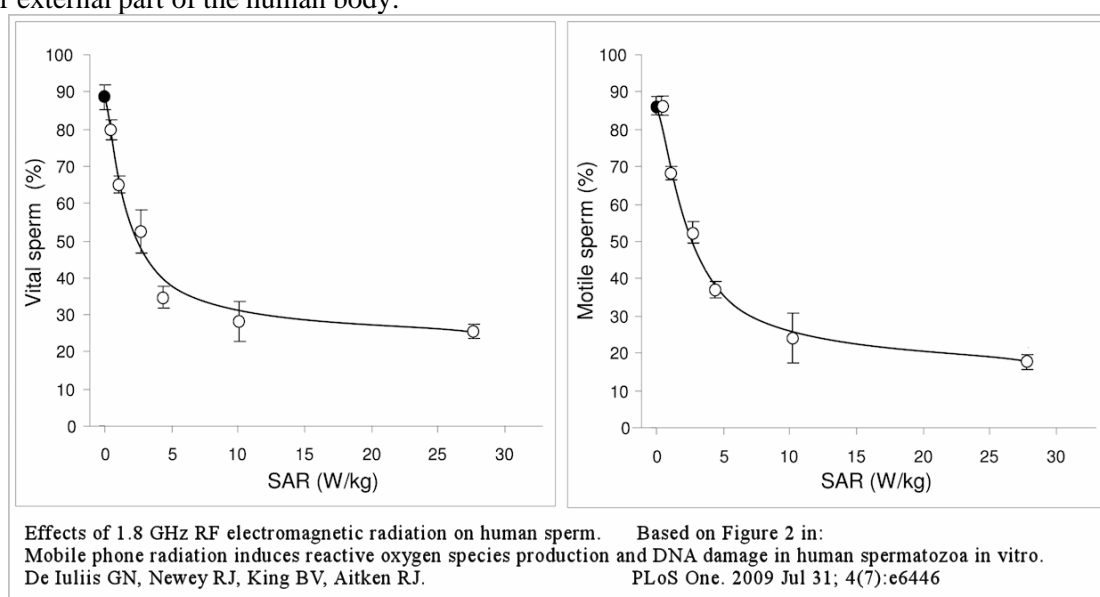
A very important paper on the effects of cell phone frequency radiation on [human](#) sperm *in vitro* was published by Geoffrey De Iuliis and colleagues in 2009^[5]. They found that RF exposure enhances mitochondrial reactive oxygen species around human spermatozoa, decreasing both their motility and vitality and increasing DNA fragmentation. They concluded: **“These 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.”

The following graphs, extracted from the De Iuliis paper, show the dramatic effect that absorbed RF radiation has on both sperm quality and their ability to move efficiently. The specific absorption rates (SAR) tested span across the range produced by cell phones in common use. At 1 W/kg, sperm vitality was significantly ($p < 0.01$) decreased from 89% to 65%, and sperm motility reduced from 86% to 68% ($p < 0.05$).

What does a 1 W/kg SAR represent? Well, cell phone safety regulations throughout Europe permit a maximum allowable SAR of 2 W/kg for cell phones held close to the head.

Higher exposures than this certainly may occur if the handset is close to other parts of the body. Many phone user manuals now state that the device should be carried at least half an inch away from the body as, otherwise, the 2 W/kg SAR may well be exceeded in nearby tissue or organs. Eyes, breasts and testicles [have electrical characteristics that mean they](#) absorb RF radiation much more highly than any other external part of the human body.



Despite these facts, there are almost no published assessments of likely SAR levels delivered to the testicles if the phone is held on the lap whilst texting or carried in a trousers/pants pocket. One theoretical study^[6] using the Brooks Air Force Base model of an adult man, predicted up to 4 W/kg peak (in the pulses) with 0.5 W/kg maximum average SAR to the testicles. Another more recent model^[7] using a different type of handset, suggested much lower levels in the region of nearer 0.2 W/kg for an adult male.

A study of rats exposed to an SAR of only 0.14 W/kg for 2 hours per day for one month showed significant adverse changes in their testicles^[8]. The diameters of the seminiferous tubules of the testes in the exposed rats were found to be lower than the sham group ($p < 0.05$).

In 2010, Nadia Falzone and her colleagues irradiated healthy active human sperm for one hour in the 900 MHz cell phone frequency band at 2 W/kg - the permitted level in the UK and Europe^[9]. The radiation caused a halving in sperm head size and an abnormally low level of sperm able to bind with the outer membrane of a human egg. This could significantly lower fertility.

Previously, Osman Erogul *et al* took semen samples from 27 healthy human volunteers, divided each sample in half, and exposed half of each sample to 5 minutes of RF from an active GSM cell phone at 10 cm distance (about the distance from a mobile phone in a pocket to a man's testicles). They then compared these with the unexposed half-samples^[10]. RF exposure caused a statistically significant decrease in forward sperm movement, as well as a reduction in total number of motile sperm.

Abnormal Sperm Morphology & Activity

There have also been a lot of animal studies. One by Maneesh Mailankot *et al* exposed male Wistar rats to 1 hour per day of active GSM cell phone radiation for 28 days. They found a significant decrease in sperm movement and activity compare with a non-exposed group of the rats ^[11].

John Aitken *et al* found that mice exposed to 900 MHz at 0.09 W/kg for 7 days at 12 h per day showed statistically significant damage to both the mitochondrial genome ($p < 0.05$) and the cell nucleus ($p < 0.01$)^[12].

Not all studies have found evidence of harm, however. In a project funded by the German Mobile Phone Health Research Program, Angela Somner and colleagues exposed male and female mice to typical levels of RF radiation from 3G/UMTS cell phones ^[13]. The authors concluded that their study did not indicate harmful effects of long-term exposure of mice over several generations. This study is an exception to the clear trend in almost all other studies of RF radiation and fertility.

The evidence that radiation from cell phones affects the sperm quantity and quality of humans and animals is compelling. The key clinical question is whether this translates into declines in actual human fertility? Though this has not been definitively proven, two recent studies are cause for serious concern.

Ashok Agarwal *et al* studied 361 men attending an infertility clinic. They were divided into four groups according to their active cell phone use: no cell phone use; 0-2 hours per day; 2-4 hours per day; and over 4 hours per day ^[14, 15]. The comparisons of mean sperm count, motility, viability, and normal sperm morphology among the four groups showed statistically significant inverse correlations.

Basically the more cell phone use, the lower the semen quality. Importantly, they found that the decrease in sperm parameters was dependent on the duration of daily exposure to cell phones and independent of the initial semen quality. Note that though the correlation was with “cell phone use” the likely cause was with direct testicular exposure from where the phone was carried and how it was used - e.g. was it held to the head or was it used using a hands-free headset whilst being carried in a pocket? This needs further investigation.

Another study, by Artur Wdowiak *et al*, looked at 304 males undergoing infertility therapy; 99 of them did not use a cell phone. They found an increase in the percentage of abnormal sperm morphology associated with the duration of RF exposure from a GSM phone^[16]. They also found that these sperm were less likely to fertilize an egg due to lack of vitality and movement; this also correlated with cumulative cell phone use.

Single short-term exposure effects usually only last for a few days. However no work has been done regarding whether chronic long-term exposure may cause permanent effects on male fertility. Testicular cancer is on the rise around the world for unknown reasons, especially in younger men - there may be a connection with RF exposure, we do not know for certain at present, but the indications of a link are very strong.

Another recent 2011 scientific study^[17] of 2110 men over the period 1993 to 2007 by Gutschi, et al, also concluded that: “Our results showed that cell phone use negatively affects sperm quality in men.”

Possible recommendations and actions

In the absence of stringent safety regulations, and in light of the growing evidence of significant biological effects, including diminished sperm function and abnormal sperm motility, it is essential that people learn how to protect themselves and minimize their risk. Physicians can play a vital role in helping them understand how to do so. Here are two steps people can take to reduce their exposure to electromagnetic fields that may help preserve their fertility:

- Do not carry a cell phone in the trouser pockets when the phone is on standby or when using a hands-free kit.
- Do not text holding the phone at waist level.

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