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Radiofrequency EMFs Overview

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From the end of the 20th century and at the beginning of the 21st century, the general public's exposure to radiofrequency EMFs, has exceeded everybody's expectations. More new applications of RF technology are being marketed every day.

The guidelines for exposure in the UK are high, and are currently based on evidence demonstrating whether the radiation is sufficient to heat up body tissue. Whilst the body responsible for drawing up these guidelines ([ICNIRP](#)) discusses athermal effects, the guidelines are not designed to take these into account until evidence for the association between EMFs and athermal effects are considered causal. There is an increasing body of scientific evidence that the non-thermal effects are replicable and consistent, but thus far no mechanism of harm is understood (though some proposals have been made [[Yariktas 2005](#), [Hyland 2008](#)]).

There are an increasing number of studies showing that the general public are experiencing a whole range of biological and neurological symptoms when exposed to long-term low level RF radiation that are not experienced by people who are not so exposed [[Santini 2002](#), [Bortkiewicz 2004](#), [Hutter 2006](#), [Abdel-Rassoul 2007](#)]. This is very concerning, as related technologies are becoming more and more prevalent, particularly amongst children and young adults. If there are adverse health effects as a result of being exposed to RF radiation at home, at school, and at leisure, then preventing risk to children should be a priority.

We summarise below some of the findings associated with different types of RF technology. More detailed information can be found by following the links at the top of the page.

Mobile phones and health effects

There have been a number of studies which conclude that use of a mobile phone, or cordless phone, even for short regular periods, for some years, leads to an increased risk of developing a brain tumour, especially on the same side of the head as the phone has been predominantly used [[Lonn 2004](#), [Hardell 2008](#)]. Some types of brain tumours investigated are malignant ones (primarily gliomas and astrocytomas), and some are benign (primarily meningiomas and acoustic neuromas). Even benign ones can be fatal if not treated. Children and young adults have never been included in these studies due to ethical restrictions.

Other health effects include a reduction in sperm quality and therefore male fertility [[Fejes 2005](#), [Erogul 2006](#), [Yan 2007](#), [Agarwal 2008](#)], memory and sleep problems

Possible health impacts

Health effects associated with exposure to radiofrequency electromagnetic fields include:

- Brain tumours
- Headaches
- Nausea
- Depression
- Sleep difficulties
- Concentration problems
- Memory loss
- Tinnitus

[Koivisto 2000, Huber 2000, Hung 2007], and a recent study has found behavioural changes in children who had been exposed prenatally to RF [Divan 2008].

Dark neurons, cells in the brain like those which are found in the brains of people with dementia were produced in the brains of rats as a result of exposure to mobile phone radiation [Salford 2003, Eberhardt 2008]. The teams believe that the brain barrier leakage allowed toxins, such as albumin, to damage the cells. The weakest fields were found to be biologically more harmful. The weakest fields could be experienced by people standing close to a mobile phone user, or even people living near mobile phone transmitter masts. Researchers have also found DNA changes [Diem 2005, Belyaev 2006, Schwarz 2008], with exposure to GSM and UMTS exposure. It is unclear how many people will be affected by RF radiation from phones, but it seems, certainly with respect to brain tumours, that the longer one is used, the more likely it is that the user will experience problems.

Digital Cordless (DECT) phones

These give off levels of RF radiation that are as high as mobile phones, sometimes higher, as mobile phones 'power down' in a strong signal area. Some of the above research also included DECT phones and they found an increased risk of brain tumours similar to mobile phones [Hardell 2006, Mild 2007]. This is especially important for those people who have switched to using a DECT phone because of uncertainties about the health effects of mobiles.

Phone Masts

It is difficult to do epidemiological studies on populations exposed to mobile phone masts, as it is unlikely that this is the only exposure to RF radiation that they will have. The telecommunications companies and regulatory bodies claim that the exposure from a mast is so low in comparison to a mobile phone, that the RF radiation could not possibly be harmful: According to the HPA (September 2008), *"Exposure levels from living near to mobile phone base stations are extremely low, and the overall evidence indicates that they are unlikely to pose a risk to health. The weight of evidence now available does not suggest that there are adverse health effects from exposures to RF fields below guideline levels. At present it seems likely that the most useful information on the possibility of a substantial carcinogenic effect of residential exposure to RF field from broadcasting/phone masts will come from extrapolation from results for other, more highly exposed groups - for instance, from studies of occupationally exposed populations."*

However, the studies that have been made, some initiated by GP practices concerned about the symptoms reported by their patients, have shown a consistent pattern of ill-health effects reported by people living near masts, when compared with those living further away [Navarro 2003, Oberfeld 2004, Hutter 2006].

WiFi

WiFi is becoming very widely used, both at home for wireless connection to the Internet, and in most UK schools. In schools, the wireless option means that laptops can be used in more than one room, without the health and safety issues of trailing wires. On 19 April 2008, the Daily Telegraph [reported](#) that approximately half of primary schools and 80% of secondary schools had WiFi computing networks installed. Children are now being exposed to RF radiation from WiFi at home and at school and it is possible that this may result in their developing cognitive problems such as concentration and memory problems and behavioural changes [Kolodynski & Kolodynska 1996, Wang 2000, Lai 2004, Divan 2008].

Radio and TV

TV and Radio Transmitters did not broadcast digitally pulsed transmissions (AM and FM radio are entirely continuous wave and TV is almost entirely continuous wave)^{[[Ha 2003](#), [Park 2004](#)]}. With the advent of digital broadcasting there are anecdotal reports of an increasing number of people who are sensitive to these types of transmissions.

TETRA

TETRA is the communications system used by many of the emergency systems in the UK. Both the handsets and base-transmitters are more powerful than normal cellular ones "to give a more secure mode of communications". The TETRA system emits electromagnetic pulses at 17 Hz, a frequency which research has found may affect brain activity. It transmits at 400 MHz, which is most current shielding materials are not particularly effective at shielding against, and some people believe they react to TETRA equipment and not to other telecommunications systems.

Radar

Radar installations around our coasts, and near to airports, both civilian and military, transmit RF radiation in pulses. They can be detected using a broadband RF receiver, and some people react to radar emissions^{[[Goldsmith 1995](#)]}. There may also be other communications systems used at airports, and military ones use different frequencies from other commercial organisations. These may be harder to detect and to screen against.

Microwave ovens

All microwave ovens leak RF radiation. Current regulations require that a microwave oven leak no more than 1 milliwatt per square centimetre when it leaves the factory, and 5 milliwatts per square centimetre after a period of use (The sealing on all microwave ovens degrades over time depending on the quality of the manufacture - it is important to get the leakage checked periodically after the first year of owning a microwave oven). We do not know if these levels are really safe and believe microwave ovens should be used with caution. Even when the microwave oven is working correctly, the microwave levels within the kitchen are likely to be significantly higher than those from any nearby cellular phone base-stations.

There is some evidence that food cooked in a microwave oven loses considerable nutritional value, and the packaging materials can leak some quite toxic chemicals into the food^{[[Lopez-Berenguer 2007](#), [Haldimann 2007](#)]}.

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