

For the National Childbirth Trust  
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## Living in a wireless world

We live in an increasingly wireless world. Many teenagers and most adults now own a mobile phone. Cordless phones and wireless broadband are used at home and work. Parents use baby monitors to listen out for their baby waking. Cafes, schools, libraries, public transport and other public places frequently offer wi-fi wireless internet and have mobile phone base stations/transmitters on their roofs, walls or located close by. The technology is incredibly useful, it gives mobility and the comfort of knowing that we are always connected. Wireless games, Wii, Nintendo DSs, iphones are rapidly becoming one of the most popular forms of entertainment for children, and are even being introduced in schools.

But are they safe? They are legal, readily available and there is a social pressure to keep up with the 21<sup>st</sup> century innovations. So why does Russia recommend that pregnant women do not use mobile phones? Why do the UK Chief Medical Officers recommend that children under the age of 16 use mobile phones only in emergencies? Why does the German Government recommend that wherever possible computer networks and the internet should be wired, rather than wireless? When we think of mobile phone safety, we often think of being careful about identity theft or cyberbullying. Occasionally the newspapers have headlines questioning whether mobile phones might cause brain tumours. But for some people the concerns go much deeper than that. To make informed choices about which technologies we want to use in our homes or for our children to use, we need to know what the concerns are, and weigh up the benefits and risks for ourselves.

### **The problem**

The problem lies in the pulsed or modulated microwaves (a type of radio wave) that these technologies use to carry information to and from each other and to their base stations/transmitters. As the number of wireless gadgets increase then so does our exposure to the microwaves all around us. Over the past few years our average exposure has increased exponentially, and it is likely to keep increasing.

So is living in a microwave environment good for us? Countries vary in the exposure limits that they set, with the UK having one of the highest limits (lowest safety). We follow the guidelines of the ICNIRP (International Commission for Electromagnetic Safety). The guidelines were set in 1998, based on the idea that microwaves have no damaging effects other than that of heating our bodies. If the power is below that which causes heating then it is assumed to be safe. But the science has moved on since then and many papers have been published demonstrating damage from microwaves below these limits. Scientists have become frustrated that the ICNIRP have not reduced their guideline values. Many scientists who are working on the biological (non-heating) safety

of electromagnetic fields have come together to form the International Commission for Electromagnetic Safety (ICEMS) and have produced resolutions which warn the public of potential risks from the technology. A report was written in 2007 by a group of scientists describing why the current guidelines were inadequate, listing much of the science available at the time (the Bioinitiative Report). Since then, the European Environment Agency has stated that they consider the current guidelines to be inadequate. The European Parliament have urged member states to introduce greater protection of the general public to electromagnetic fields. Liechtenstein has voted to reduce its exposure limits by 100. France is beginning trials of these lower limits in sixteen of its towns. The French Health and Security Agency recommended in 2009 that people reduce their exposures to mobile phones and wireless devices. Russia already has exposure limits 100 times lower than in the UK. Salzburg in Austria recommend exposure limits 1000 times lower than in the UK. A scientific panel, The Scientific Panel on Electromagnetic Field Health Risks, is currently writing new guidelines based on what they consider to be biologically safe and these will be published later this year. It remains to be seen whether these will be adopted by governments. There are economic and political pressures too.

### **The evidence**

Concerns are based on studies that show damage to or changes in cells or body systems. I will concentrate on fertility, pregnancy and young children here, but effects have been found in virtually every system in our bodies. It appears that our cells are very sensitive to electromagnetic fields.

#### **Male fertility**

Many studies have found decreased fertility for men who use mobile phones. The evidence is now strong and convincing. Effects are decreased sperm motility, abnormal sperm shape, decreased viability, and in some studies decreased sperm count and smaller diameters of the tubules in the testicles. Sperm is even affected when exposed in a test tube for five minutes to a mobile phone. Last year a research group found that mobile phone exposure for 16 hours damaged sperm DNA. Damaged DNA is bad news. Our DNA contains the instructions to make our bodies develop and function correctly. Damage could mean abnormalities in the next generation. When it comes to the lower powers of mobile phone mast transmitters or wireless internet (wi-fi), we don't yet have information for human male fertility. From animal studies, it appears that you need to be exposed for longer to low power microwave environments to decrease male fertility. Male rats have reduced fertility after living near a mobile phone mast for 6 months or exposed to similar conditions as someone using a wireless laptop for several hours a day over several months. It is possible or even likely that the same conditions could also reduce human male fertility.

#### **Pregnancy**

In 2008 scientists in Denmark reported that when women (over 100 000 of them) used a mobile phone during pregnancy, there was an increased risk of behavioural problems in the children, measured at age 7. The behavioural changes could have been the result of

exposure to the radiation emitted by the phones, or a social factor such as the lack of attention from the mother whilst she was on the phone when the children were young. But when you also take into account studies such as one in rats that has shown that exposing pregnant rats to a mobile phone for one hour a day during pregnancy led to abnormal dead cells in the brain of their offspring and fewer healthy cells in regions involved in learning and memory after birth, then it becomes more worrying. Changes in the genes 'switched on' during a baby's development in the womb have also been described in rats that were exposed to a mobile phone during pregnancy. Which genes are 'switched on' determines how the baby develops. A research group in Saudi Arabia found that a mobile phone held close to the abdomen of pregnant women for ten minutes increased the baby's heart rate and decreased the amount of blood being pumped by the heart. Scientists have found that when rats were exposed to a mobile phone in standby mode, switched on to speech mode for 15 minutes twice a day during pregnancy, the female babies had an average of 30% fewer follicles (containing the eggs) in their ovaries after birth. If this were to happen in humans then it could seriously reduce the fertility of the next generation of females. We don't know whether it was the 11 hours and 45 minutes in standby or the 15 minutes in speech mode that led to the decreased fertility. If it was the former then it is likely that living in a wi-fi environment could also reduce the fertility of subsequent generations. Studies haven't yet looked at possible DNA damage in mammalian egg cells. Girls carry all of their eggs from birth, so they have a long time for potential DNA damage to occur. But a lot of studies have found damage to DNA, in cells from many regions of the body, following exposure to mobile phone radiation. (DNA damage is not seen in every study, so the conditions necessary for effects need to be better understood and identified). Damaged DNA could potentially lead to cancers or developmental abnormalities.

### Children

Children absorb more radiation than adults. Their skulls are thinner and the opportunity for damage is greater because their cells are dividing more. Studies into whether mobile phones increase the risk of brain tumours are starting to indicate that young people are more at risk. Studies of brain tumour risk in adults are generally negative (i.e. no effect) when you look at the first 10 years of using a mobile phone. After 10 years of use most studies have found significantly increased risks of developing some brain tumours, when the tumour is on the same side of the head to which the phone was held. A Swedish group have found that the greatest risk of brain tumours was in those that started to use a mobile or cordless phone under the age of 20. Children may be at a greater risk of damage from wireless phones than adults. Using a mobile phone also alters the activity of the brain. Since our brains are still developing into our late teens, the changes in activity could alter brain development. A study recently in the news described how exposure to a mobile phone was beneficial in mice that had some of the characteristics of Alzheimer's disease. This could be very exciting. But the radiation used was not modulated, as mobile phone signals usually are, so it was not exactly the same as mobile phone radiation. In some previous studies modulated mobile phone signals have resulted in brain cell damage and a decrease in learning ability or memory in rats or mice. So we don't yet know whether mobile phones could help long-term in reducing Alzheimer's risk, or in fact lead to dementia through brain damage.

There are still many unanswered questions and much more research needs to be done. But there is enough known to suggest that these technologies may not be safe for everyone.

The precautionary principle could be used when it comes to wireless technologies. This would mean taking the safest option when there is the potential for serious harm to health or the environment, based on scientific evidence, even if there are still some uncertainties about the risk.

### **What we can do?**

Changing the legal limits for exposure needs political action and possibly public awareness and pressure. But whilst governments debate the possible risks and weigh those up against economic considerations, we can decide for ourselves which technologies we want to use and when.

When it comes to pregnancy, the Russian National Committee for Radiation Protection recommends that pregnant women do not use mobile phones at all. Maine in the USA is planning to introduce warning labels for pregnant women and children on all new mobile phones. The International Commission for Electromagnetic Safety also recommend safer use of mobile phones around pregnant women.

If you want to take a precautionary approach then when pregnant you could choose not to use a mobile or cordless phone, but use a corded landline telephone. You could avoid using a wireless laptop on your lap or close to your bump when pregnant. Better still, use a computer or laptop connected to the internet via a wire (and switch off the wifi function on the computer). At night, it might be advisable not to sleep next to your mobile or cordless phone (unless it is completely switched off), and to use an alarm clock, not your phone to wake yourself up. Similarly if you have a cordless phone, you could place the base station away from where you sit or spend a lot of your time. In the summer, if you don't have a bag to carry your mobile phone in, don't carry it in your bra! (it does happen). Texting is considered safer than speaking with your phone close to your head because the phone is further away from your body. But be careful when pregnant that you aren't texting on your mobile phone whilst holding it close to your bump.

Again, taking a precautionary approach, you could choose not to use your mobile or cordless phone when holding your baby or toddler, and don't offer it to them to 'speak' on or to listen to. You could have a corded phone for children. Don't keep your mobile phone switched on in the pocket at the back of your pushchair where it is next to your baby's body. Don't be tempted to give your toddler or child your mobile phone or other wireless gadgets to play with to keep them quiet or entertained. Think whether you really want a wireless baby monitor, or whether you could manage without one.

For men who want to father children, many scientists and health advocacy groups now advise that you don't carry your mobile phone in your trouser pocket when switched on

or in standby mode. Don't use a wireless laptop on your lap and better still use a laptop or computer which is connected via a wire. Sperm take approximately 3 months to develop, and after that time new ones are produced.

When it comes to public places then society and governments need to work out whether there are human rights violations in exposing everyone to pulsed microwaves at exposures that could potentially damage their health. Moral questions arise when it comes to exposing others to second hand radiation. Employers need to consider their responsibility to provide safe working environments for their employees and people using their premises. In public places we currently don't have much of a say about our exposures. But if you aren't happy having the mother and toddler group in the local library next to the wi-fi transmitters, then why not let the library know? If you would rather the antenatal group wasn't held in a building with phone mast transmitters all over or next to it, then perhaps say so. Mother and baby groups could choose to meet in non-wireless cafes rather than wireless ones. The technology does exist for fast fibre optic or wired broadband in our homes, offices and libraries. In France, some towns are installing fibre optic networks to all homes and offices, as they are faster, more secure and safer than wireless.

Perhaps parents should question when and how they use wireless devices and whether they should expose their babies or children. Should we be developing safer technologies and should new ones in the future require safety testing, as we insist on for new medicines? More and more technologies are being developed that will enter the body or be absorbed by it. Whatever the technologies of the future are, we need to make sure that they are safe for babies, children, in fact all of us, and that they won't damage our DNA. We need healthy DNA for healthy future generations.

**For further information:**

<http://www.icems.eu/>

[http://www.icems.eu/public\\_education.htm](http://www.icems.eu/public_education.htm)

<http://www.bioinitiative.org/>

<http://wifiinschools.org.uk/>

<http://wiredchild.org/>

<http://www.powerwatch.org.uk/>

<http://www.fullsignalmovie.com/>

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