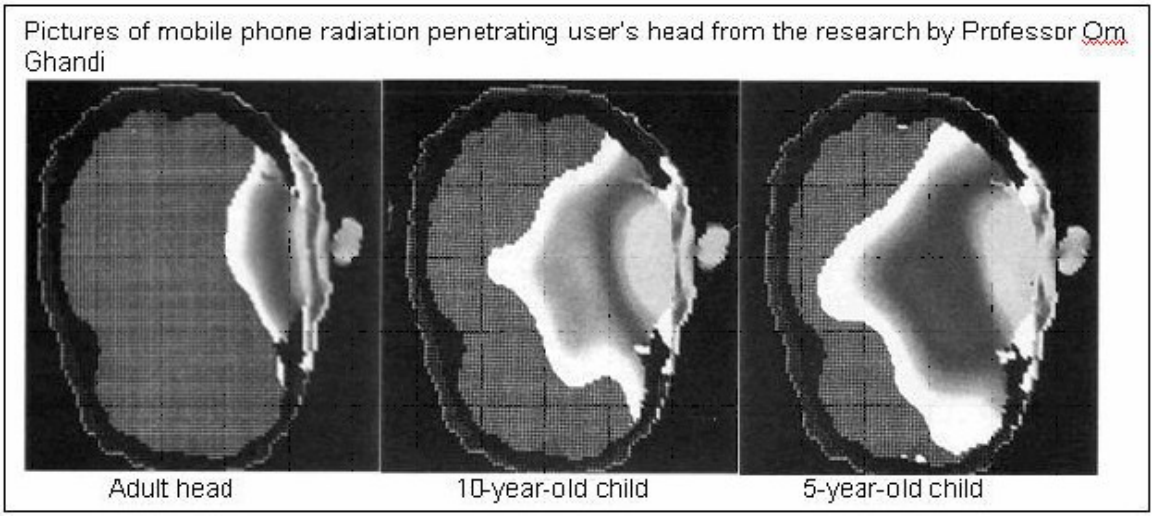
Children and Mobile Phones

The research findings

Addiction

The addictive properties of mobile phones seem to be based on two hypotheses. There is a social addiction in young people, who do not wish to feel separate from their peer group, there is also a potential chemical addiction first identified by Lai (1992).

Brain effects



Professor Om Gandhi, head of electrical engineering at the University of Utah in Salt Lake City, using life-size models and computer-generated images, found that 5-year-old children absorb 50% more radiation than adults during a call. Scans showed that while radiation spread a short distance from the ear in adults, in the youngest children it spread across most of the brain. "*More radiation can go through since the child's ear is thinner, the telephone is closer to the head and this thinner ear doesn't absorb so much power. Therefore more is able to go past the ear into the head. All it takes is two millimetres difference.*" Said Professor Om Ghandi, University of Utah, quoted in the Express newspaper, November 2001.

The radiofrequency microwave radiation thus has the potential to be far more disruptive to the biological processes going on in the child's growing and developing brain and nervous system.

Dr Gandhi's work triggered a backlash from the industry which, he says, has left him without research funding and the subject of mudslinging at industry-dominated meetings. "*I have been marginalised for the last three years because I would not back down from what I was publishing*" he says.

Dr Bill Guy, although not in full agreement with Gandhi's findings, and Dr Gerard Hyland, admit that the radiation will penetrate children's heads more deeply because of their smaller size - with the radiation exposing regions of their brains that are relatively unexposed in adults. Work by scientists at the Jerusalem College of Technology suggest that the human head, being oval with a

short axis on average 16-17 cms in length, will act as an antenna for mobile phone signals. Brain tissue could act as a radio receiver.

Dr Camelia Gabriel (MCL and SARtest, UK) points out that children have different electrical properties in their tissues, which change to approximate adult properties as they grow older. She believes further research is needed to understand the implications for health of these differences.

Professor Sianette Kwee, of the University of Aarhus, Denmark, who is part of the European Union's COST 281 project 'Potential health effects from Emerging Wireless Communication systems' reports that "*Our studies showed that there was a significant change in cell growth in human amnion cells after being exposed to EMF fields from both power lines (ELF) and from mobile phones (MW). These biological effects were greatest in young and vigorously growing cells. These results tell us, that e.g. microwave fields from mobile phones can be expected to affect children to a much higher degree than adults.*"

The influential BioInitiative report (2007) states *"The consequence of prolonged exposures to children, whose nervous systems continue to develop until late adolescence, is unknown at this time. This could have serious implications for adult health and functioning in society if years of exposure of the young to both ELF and RF result in diminished capacity for thinking, judgment, memory, learning, and control over behaviour."* As well as evidence for an increased risk of brain tumours, they concluded that it was possible that breast cancer, DNA changes and changes in the blood vessels associated with heart disease were also associated with radiofrequency exposure.

Despite the concern about the potential hazards of children using mobile phones, we see the market being exploited without this consideration, see Section 1.

Brain tumours

The risk of developing brain tumours is one of the most researched potential health effects (Hardell 2003, 2006, 2006, Kundi 2004, Lönn 2004, 2005). It can take many years before a damaged cell has grown sufficiently to cause symptoms that are diagnosed as cancer. The concern is that even low levels of mobile phone use are linked to increased risk (Hardell 2009), and this paper revealed that the situation is worse for those who use phones before the age of 20. There has been a 40% increase in brain tumours in Australia in the last 20 years. It has taken over from leukaemia as the biggest child cancer killer.

The Hardell (2006) study suggests that there is a statistically significant increase in brain tumour risk after 5 years of mobile phone use, and there was a dose-response relationship, where the more hours a phone was used resulted in ever increasing risks of developing tumours. For acoustic neuromas (benign tumours on the acoustic nerve), there seems to be little further increase after 10 years, however for all benign tumours grouped together, the increase with time is significant. This seems to bear out the work published by Lönn (2004). This study is particularly important because acoustic neuromas are considered to be a signal tumour for other types of malignant and benign brain lesions. These tumours occur in areas with the highest radio frequency radiation exposure during calls.

One worrying finding is the statistically significant association of all benign brain tumours with cordless phone use, showing a doubling in risk for more than 10 years use, at a very low average use time per day. A greater risk is associated with having used mobile phones for more than 15 years, a finding consistent with other studies showing that risks dramatically increase after six and ten years of use.

The Hardell study has much better data than the Schoemaker paper (2005) which used virtually the same team as the Hepworth glioma study (2006) which stated that it couldn't find any relation for under 10 years use but could not say for 10+ years mobile phone use.

Most of the high-grade glioma patients were not included due to being too ill, or having died. This meant that no conclusions could be drawn with respect to EMFs and the cause or proliferation of a glioma.

Professor Michael Kundi of Vienna University says "*Nothing on earth is suspected, let alone known, to induce glioma within a few years*," and as the duration of phone use in the Schoemaker study is very short and there were only 10 cases, only an effect on tumour development and growth (not cause) could have been observed. He suggested that only ipsilateral tumours (tumours on the same side of the brain as the phone was held) were important, and an increase in risk is exactly what the study found. In a review of 9 studies on mobile phone use, Kundi (2004) found the risk of developing acoustic neuroma tripled and the risk of uveal neuroma quadrupled. This confirms report of Lönn (2004). Kundi said that a child's skull contains many more stem cells, which can form blood cells, than that of an adult, and the earlier in life a malign transformation occurs, the more likely it will result in a clinical malignancy.

Laboratory tests conducted by Repacholi (1997) revealed a highly significant doubling of cancer rates. The study looked at 200 mice, half exposed to pulsed digital phone radiation (equal to cell phone transmission from a handset) for two half-hour periods each day. A significant increase in B-cell lymphomas was evident early in the experiment and continued to rise over 18 months. The exposed mice had over twice the tumor rate of the unexposed mice.

Learning, memory and behaviour changes

In 2001, Dr Michael Klieeisen from the Spanish Neuro Diagnostic Research Institute in Marbella, Spain [www.findarticles.com/p/articles/mi_qn4161/is_20011202/ai_n14543438], found that a mobile phone call lasting just 2 minutes can alter the electrical activities and biochemical processes in a child's brain for up to an hour afterwards. This may lead to psychiatric and behavioural problems, or reduce the body's immunity to infection and disease. He says "*We never expected to see this continuing activity in the brain. My advice to all parents is not to allow children to use mobile phones*."

Dr Gerard Hyland, a UK spokesman on mobile phones said, "*Children's brains are affected for long periods even after very short-term use. Their brain wave patterns are abnormal and stay like that for a long period. This could affect their mood and ability to learn in the classroom if they have been using a phone during break time, for instance. We don't know all the answers yet, but the alteration in brain waves could lead to things like a lack of concentration, memory loss, inability to learn and aggressive behaviour*."

This change in brain activity may be linked to the reduced ability to learn and remember (Lai 1994, Wang 2000). It may not be helpful to our school-age children to impair their ability to learn at the time where they spend most of their time trying to do just this. Lai (2004) also found an intriguing effect with other environmental EMFs, in that exposure to a specific form of magnetic fields blocked the learning and memory deficits. Abramson (2009) found that in children reporting more mobile phone voice calls, the accuracy of working memory was poorer, reaction time for a simple learning task shorter, associative learning response time shorter and accuracy poorer.

Microwave radiation has also been linked to mood and behaviour changes, possibly more so in boys. Reports of animal behaviour, in personal emails from New Zealand, indicate that stallions and bulls seem more affected by microwave exposure than mares and cows. As more schools are reporting problem behaviour, which will affect the concentration of students other than the misbehaving youngster(s), we may already be seeing some of the effects.

Microwave radiation has shown to break down the blood brain barrier (Bortkiewicz 2001, Salford 2003, Schirmacher 2000), which is our natural defence against letting poisons into the brain. Alcohol and non-prescribed drugs are poisons to the brain, and mobile phone use may well allow these to enter the brain, possibly giving rise to some of the antisocial behaviour that is seen increasingly, especially in our towns and cities.

Salford's study showed that blood brain barrier damage increased according to the amount of exposure. Just 2 hours of accumulated mobile phone radiation killed a number of nerve cells in the brain. The brain lesions may be indications of a condition similar to early onset dementia. Many hospitals are now reporting the need to set up units for people aged under 50 with dementia, as the current facilities are not adequate to deal with the increased demand. As a result of this experimental result, Norbert Hankin, environmental scientist from the US Environmental Protection Agency, commented *"The concern is that if such effects may occur in young children, then even slight impairment of learning ability over years of education may negatively affect the quality of life that could be achieved by these individuals, when adults."* (Letter to Dr George Carlo, Radiation Protection Project, April 2000).

Eye damage

In 2005, Dovrat from the Rappaport Faculty of Medicine at the Israel Institute of Technology, Haifa, found that microwave exposure caused bubbles to form within eye tissue, which did not disappear over time – an indication of the development of cataracts. The research leader, Professor Levi Schächter, said of their findings *"microwaves can cause irreparable damage. Our advice to people with mobile phones is not to use them if they have the option of using a land line until we can conduct more research."* There is already a well established link between occupational microwave exposure and eye damage.

Mouth cancer

Every year in the UK, there are 4,300 new cases of mouth cancer diagnosed and 1,700 deaths. In November 2004, John Hamburger, a senior lecturer at Birmingham Dental Hospital, warned of an increase in mouth cancer among teenagers and children in the West Midlands. The British Dental Health Foundation (BDHF) said about 25% of mouth cancer cases in younger people did not involve the most common causes of the illness which are smoking and drinking alcohol to excess. A factor that has simply not been assessed is mobile phone usage, and we know that young people are some of the heaviest phone users. Mouth cancer would be very close to where a regular mobile phone user would be holding their phone. Children wearing braces may be even more at risk, because of the conductive qualities of the metal.

DNA, cellular and organ damage

The Reflex Study, [www.powerwatch.org.uk/news/20041222_reflex.asp], which was supported by the EU at a cost of more than two million Euros, was carried out at various important research centres in Europe. In the course of this study, the so-called mutagenicity (the ability of a

substance to cause changes (mutations) in the DNA of cells) of electromagnetic fields was tested. They looked for changes in the genes which are the possible beginning of a cancer. In one part of the study, tests were carried out on human promyelocytes - a preliminary stage of the cells of blood formation. A mutation of such cells can, as a further consequence, lead to leukaemia and similar illnesses of the blood forming system.

The results from these studies can be summarised in one sentence: There is indeed a genotoxic (the ability of a substance to damage DNA) effect on human cell cultures from mobile phone radiation at a strength that is supplied by every GSM mobile phone.

Professor Henry Lai and his team at the University of Washington, Seattle has published the results of his studies which revealed genetic damage in the DNA of exposed rats (Lai & Singh 1995, 1996). They found that after their laboratory rats were exposed to the low RF radiation for a relatively short period, the DNA strands in the brain were being broken up. He said that DNA breaks do not always lead to cancer, but it can be a factor, as cancer is such a complicated process.

Microwave radiation penetrates the body and can affect the cells of soft tissue. It is difficult to know where to carry a mobile phone to avoid radiating vulnerable parts of the body. Eazytrack,, makers of mobile phones, provide a free "headset necklace" to carry the 'Owl' phone around the child's neck, which will of course leave it dangling next to their heart, breast buds, and other major organs. We cannot recommend carrying a phone here.

Reproductive effects

Many young people are using their phones to 'text' their communications. This is cheaper, as the call is charged only when the message is sent, and it keeps the child's head away from the phone. It is important that the phone is held away from the body when the call is connected (which is always at full power). The soft tissue most at risk in boys is the testicles, which are particularly vulnerable to microwaves. They may potentially have reproductive problems due to changes in fertility or damaged sperm cells (Fejes 2005, Erogul 2006).

Effects on sleep

In a paper presented at SLEEP 2008, the 22nd Annual Meeting of the Associated Professional Sleep Societies (APSS) in Baltimore in July, Dr Gaby Badre said that teenagers who send more than 5 text messages a day on their mobile phones or make more than 5 calls are ruining their chances of getting a good night's sleep. A good night's sleep is a prerequisite for good health, as much of the body's biological repair mechanisms are active at this time. Dr Badre continued "*Addiction to cell phone is becoming common. Youngsters feel a group pressure to remain inter-connected and reachable round the clock. There seems to be a connection between intensive use of cell phones and health compromising behaviour such as smoking, snuffing and use of alcohol.*" There are clearly other lifestyle issues which make this finding less straightforward.

Official comments on the implications of the health research

Eric Huber, the Speaker for Environmental Medicine for the Doctor's Chamber for Vienna said "*If medications delivered the same test results as mobile phone radiation one would have to immediately remove them from the market.*" He continued "*We must assume that children are more sensitive towards high frequency radiation than adults since the skull bones are thinner and the children's child-like cells show an increased rate of division, in which they are more sensitive to genotoxic effects.*"

As a response to this research Dr Michael Clark of the HPA-RPD said *"If future research delivers the same or similar results then public health practices may need to be re-examined."*

The difficulties with the research

Dr Jerry Phillips, a well-known cellphone researcher in the USA with dozens of peer-reviewed papers published under his name, said "*There's so much money involved, that the only thing industry sees is the money. They couldn't give a damn about basic science*." Dr Phillips and colleagues found changes in the expression of rat genes exposed to cellphone signals. They did not know what it meant, but they knew it was noteworthy. Dr Mays Swicord, director of electromagnetic research at Motorola, said "*You need to include a statement in here that, even though you see a change in this one gene, that it's of no physiological importance*." Phillips replied "*I can't say that. I don't know whether it is or not*." When the study was published in 1997, it contained a sentence at the end which Phillips says he never wrote. It states that changes he discovered are "probably of no physiologic consequence."

Dr Henry Lai of the University of Washington, Seattle, said that among the peer-reviewed, published studies with no direct industry funding, biological effects from cellphone frequencies, such as altered gene expression, DNA breaks and death of animal brain cells, were noted 81 per cent of the time. When corporate money is directly funding the science, effects were noted only 19 per cent of the time.

In 36 studies focused on genetic effects, such as DNA damage, 53 per cent showed some kind of biologic effect that might indicate concern. Of those studies, a vast majority, 79 per cent, were independent. Conversely, studies showing *no effects* had direct industry funding 82 per cent of the time.

When Dr Leif Salford, a neurosurgeon in Sweden, published a study in 2003 showing that rat brain neurons were dying from exposure to cellphone radiation, he warned there might be similar effects in humans that over time could lead to degenerative diseases of the brain. His study was written off by the industry as a 'novel' finding that needed to be replicated. "*But the other guys who have tried to do the same thing have not got their papers published*" said Salford. He rated the reality of brain damage as a "*probability rather than a possibility*."

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