

*Scientific Paradigm Review****How Smart Meters May Cause Autism and Cancer****- Andrew Goldsworthy, PhD*

**“The strong regular transmissions from wireless smart meters are particularly harmful and more likely to lead to DNA damage, cancer and autism.”**

**Abstract**

There is increasing evidence that wireless transmissions have biological effects, some of which are harmful, at levels that may be orders of magnitude below present safety guidelines. These guidelines were drawn up on the assumption that the radiation could only damage living tissues if it generated significant heat. It has since been shown that radiation at much lower levels has direct electrical effects. These are mainly on electrically charged cell membranes, where the low frequency pulses from the modulated microwaves make them vibrate and leak. This can give rise to many “modern illnesses” ranging from electromagnetic hypersensitivity to cancer and disorders of the immune system. The most dramatic increase in the incidence of autism due to damage to the developing brains of the fetus and young children. Modulated microwaves, such as those from cell phones, portable phones, WiFi, baby monitors and wireless smart meters are sources of potentially damaging radiation. The strength of the radiation appears to be less important than the duration and pattern of the exposure, with intermittent and repeated exposure being the most damaging. The strong regular transmissions from wireless smart meters are particularly harmful and more likely to lead to DNA damage, cancer and autism.

**Sub-thermal effects of electromagnetic radiation.**

There are thousands of scientific papers showing biological effects of non-ionizing electromagnetic radiation occurring well below the levels at which they can generate significant heat. Many of these have been reviewed at by expert scientist at [www.bioinitiative.org](http://www.bioinitiative.org) and <http://www.neilcherry.com/documents.php>. They include harmful effects such as damage to DNA in living cells that can lead to cancer, loss of fertility, brain damage due to the disruption of the blood-brain barrier and neuronal hyperactivity leading to autism in children. Many of these effects can be attributed to the loss of structurally important calcium from cell membranes, which makes them leak. This can disrupt normal metabolism and also release DNase (which destroys DNA) from the internal structures (lysosomes) that normally recycle waste into the rest of the cell [http://www.hese-project.org/hese-uk/en/papers/cell\\_phone\\_and\\_cell.pdf](http://www.hese-project.org/hese-uk/en/papers/cell_phone_and_cell.pdf)

**“The effect on DNA damage was still greater if the microwaves were pulsed or modulated.”**

### **Prolonged and intermittent radiation causes more damage**

The duration of the radiation seems to be more important than its strength, with the effects being cumulative as more and more cells are damaged. Interestingly, DNA damage from cell phone radiation is greater when the exposure is intermittent (5 minutes on, 10 minutes off) than when continuous (Diem et al 2005). This may be because the cells are constantly adapting and using energy to defend themselves; they drop their guard during the off period and are caught unawares when it goes on again. This constant switching uses more energy, which eventually leaves the cells less able to counteract the effects of the radiation.

Diem et al. (2005) also found that the effect on DNA damage was still greater if the microwaves were pulsed or modulated to carry information (modulation involves sudden stops and starts of the signal, which are even more damaging).

Smart meters, which operate 24/7 and radiate modulated microwaves intermittently, can therefore be expected to be particularly harmful to DNA.

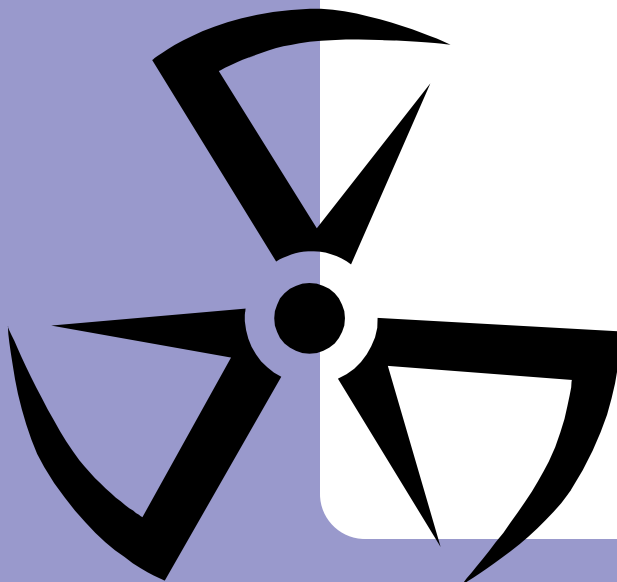
### **Microwave radiation causes cancer**

There is already evidence that heavy cell phone users are more prone to brain cancers. This has resulted in cell phones now being rated by the World Health Organisation as class 2B carcinogens. This rating may later be increased, since brain tumours normally take decades to develop and few people have been regularly using a cell phone for more than a single decade. Particularly worrying is the finding by Hardell and Carlberg (2009) that young people were about 5-times more likely to get brain cancer both from cordless and cell phones if they began using them before the age of 20. The regular transmissions from wireless smart meters can be expected to have much the same effect, with younger people being more at risk. This is possibly because their brain structure is still growing and developing and therefore more susceptible to damage leading to cancer.

### **The effect of microwaves on autism is far worse**

The greatest damage from microwaves is when the brain is first developing in the foetus and the very young child, when it can lead to autism. Dr Dietrich Klinghardt has recently shown the relationship between microwaves and autism; a summary of his work can be found at

<http://electromagnetichealth.org/media-stories/#Autism> .



## **What is autism?**

Autism is in fact a group of life-long disorders (autistic spectrum disorders or ASD) caused by brain malfunctions and is associated with subtle changes in brain anatomy (see Amaral et al. 2008 for a review). The core symptoms are an inability to communicate adequately with others and include abnormal social behaviour, poor verbal and non-verbal communication, unusual and restricted interests, and persistent repetitive behaviour. There are also non-core symptoms, such as an increased risk of epileptic seizures, anxiety and mood disorders. ASD has a strong genetic component, occurs predominantly in males and tends to run in families.

## **Genetic ASD may be caused by calcium entering neurons**

It has been hypothesised that some genetic forms of ASD can be accounted for by known mutations in the genes for ion channels that result in an increased background concentration of calcium in neurons. This would be expected to lead to neuronal hyperactivity, the formation of sometimes unnecessary and inappropriate synapses, which in turn can lead to ASD (Krey and Dolmetsch 2007).

## **Electromagnetic fields let calcium into neurons too**

There has been a 60-fold increase in ASD in recent years, which cannot be accounted for by improvements in diagnostic methods and can only be explained by changes in the environment. This increase corresponds in time to the proliferation of mobile telecommunications, WiFi, and microwave ovens as well as extremely low frequency fields (ELF) from mains wiring and domestic appliances. We can now explain this in terms of electromagnetically-induced membrane leakage leading to brain hyperactivity and abnormal brain development.

## **Non-ionising radiation makes cell membranes leak**

The first effect of non-ionising electromagnetic radiation is to generate small alternating voltages across the cell membranes, which destabilize them and make them leak. This can have all sorts of consequences as unwanted substances diffuse into and out of cells unhindered, and materials in different parts of the cell that are normally kept separate, become mixed.

## **Why weak fields are more damaging than strong ones**

We have known since the work of Suzanne Bawin and her co-workers (Bawin et al. 1975) that modulated radio-frequency electromagnetic radiation that is far too weak to cause significant heating can nevertheless remove calcium ions (positively charged calcium atoms) from cell membranes in the brain. Later, Carl Blackman showed that this also occurs with extremely low frequency electromagnetic radiation (ELF) but only within one or more “amplitude windows”, above and below which there is little or no effect (Blackman et al. 1982; Blackman 1990). A proposed molecular mechanism for this can be found in Goldsworthy (2010). In particular, it explains why weak electromagnetic fields can have a greater effect than strong ones and why prolonged exposure to weak fields (where cells are maintained in the unstable condition for longer) is potentially more damaging than relatively brief exposure to much stronger ones.

## **How calcium ions stabilize cell membranes**

This loss of calcium is important because calcium ions bind to and stabilize the negatively charged membranes of living cells. They sit between the negatively charged components of the cell membrane and bind them together rather like mortar binds together the bricks in a wall. Loss of just some of these calcium ions destabilize the membrane and make it more inclined to leak, which can have serious metabolic consequences. Among these are the effects of membrane leakage on the neurons of the brain.

## **How membrane leakage affects neurons**

Neurons transmit information between one another in the form of chemical neurotransmitters that pass across the synapses where they make contact. However, the release of these is normally triggered by a brief pulse of calcium entering the cell. If the membrane is leaky due to electromagnetic exposure, it will already have a high internal calcium concentration as calcium leaks in from the much higher concentration outside. The effect of this is to put the cells into hair-trigger mode so that they are more likely to release neurotransmitters and the brain as a whole may become hyperactive (Beason and Semm 2002; Krey and Dolmetsch 2007, Volkow et al. 2011). This may not be a good thing since the brain may become overloaded leading to a loss of concentration and what we now call attention deficit hyperactive disorder (ADHD).

## **How does this impact on autism?**

Before and just after its birth, a child's brain is essentially a blank canvas, and it goes through an intense period of learning to become aware of the significance of all of its new sensory inputs, e.g. to recognise its mother's face, her expressions and eventually other people and their relationship to him/her (Hawley & Gunner 2000). During this process, the neurons in the brain make countless new connections, the patterns of which store what the child has learnt. However, after a matter of months, connections that are rarely used are pruned automatically (Huttenlocher & Dabholkar 1997) so that those that remain are hard-wired into the child's psyche. The production of too many and often spurious signals due to electromagnetic exposure during this period will generate frequent random connections, which will also not be pruned, even though they may not make sense. It may be significant that autistic children tend to have slightly larger heads, possibly to accommodate unpruned neurons (Hill & Frith 2003).

Because the pruning process in electromagnetically-exposed children may be more random, it could leave the child with a defective hard-wired mind-set for social interactions, which may then contribute to the various autistic spectrum disorders. These children are not necessarily unintelligent; they may even have more brain cells than the rest of us and some may actually be savants. They may just be held back from having a normal life by a deficiency in the dedicated hard-wired neural networks needed for efficient communication.

## Autism and the economy

The incidence of autism has increased 60-fold, in parallel with the increase in electromagnetic pollution over the last thirty years. The chance of having an autistic child may now be as high as one in fifty. Apart from the personal tragedies for the affected children and their families, autism is of enormous economic importance. In the UK alone, the annual cost to the Nation in care and lost production exceeds the annual tax revenue from the entire mobile phone industry, which is about 20 billion UK pounds.

<http://www2.lse.ac.uk/newsAndMedia/news/archives/2009/05/MartinKnappAutism.aspx> In theory the Government could close down the entire mobile phone industry and actually show a profit!

There are ways in which the modulation of the signal can be changed to avoid this, but in the meantime, the compulsory introduction of smart meters can only contribute further to autism on a grand scale. This will be a further burden on the economy and increase the National deficit. This will far outweigh any possible advantages from the use of these meters.

There is also a risk of legal complications for the utility companies. If it can be shown that the consumer has taken reasonable precautions to minimise their microwave exposure by eliminating WiFi, cordless phones and wireless baby monitors from their house, the utility company could be held legally responsible for any autistic children that they may have.

In the UK, the lifetime cost of caring for an autistic child is in the region of one million pounds. It would be reasonable to claim compensation for this amount. In the United States, it may also be possible to claim punitive damages if it can be shown that the utility company knew of this risk when they installed or refused to remove a smart meter when requested.

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*Andrew Goldsworthy was born in 1939. After a conventional Grammar School education he obtained a First Class Honors Degree in Botany followed by a PhD for research into plant physiology and biochemistry at the University of Wales. He went on to lecture at Imperial College London, where he spent the rest of his career. He has had many teaching and research interests, ranging from the biochemistry of photorespiration to the biology of space flight. He retired in 2004 but remains as an honorary lecturer. He was also a scientific advisor to the European Space Agency and is currently a scientific advisor to several European charities concerned with the environment and electromagnetic fields, including the Bio Electromagnetic Research Initiative, the Radiation Research Trust, and*

*Electrosensitivity-UK. He has always had a strong interest in how living organisms use internally-generated electric currents to control their growth and metabolism, and in their disruption by externally-applied currents and fields. In his retirement, he pieced together nuggets of information from a wide range of scientific journals and created simple layperson's explanations of how weak electromagnetic fields affect us all. The first of these can be found at <http://tinyurl.com/2nfujj>. The present article was submitted at the request of the Canadian House of Commons Standing Committee on Health for a hearing on April 29th 2010 on the biological effects of microwave radiation".*

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