

# Why mobile phone masts can be more dangerous than the phones

*Andrew Goldsworthy BSc PhD , March 2008*

## **Abstract**

Living cells have a range of negative feedback mechanisms that sense non-thermal radiation damage and use it to trigger various defence systems. These systems are expensive in energy and resources and also reduce metabolic efficiency. The object therefore has to be to keep this damage within 'tolerable' limits rather than to eliminate it. They do this by cutting in only when they approach the limits of toleration. The effect is to keep the damage at or close to these 'trigger points' over a wide range of radiation levels, ranging from that due to a mobile phone handset held close to the head, to that from a mast, which may be hundreds of metres away. The radiation from a handset may actually be less damaging since it is used only intermittently and the body has a chance to recover in between times. However, continuous irradiation from mobile phone base stations, DECT phone base stations and Wifi routers may not allow adequate recovery time, so chronic irradiation from these sources could be far more damaging and more likely to result in cancer, allergy-related conditions and electromagnetic hypersensitivity. There is an urgent need for further research in this area, since the assumption that the only biological effects of non-ionising radiation are due to heating, and fall off rapidly with distance, no longer fits the facts.

## **Introduction**

People living close to mobile phone masts (base stations) frequently report symptoms of electromagnetic hypersensitivity such as dizziness, headaches, skin conditions, allergies and many others, the mechanisms for which are only just beginning to be understood (see [The Dangers of Electromagnetic Smog](#)). There is also growing anecdotal evidence for cancer clusters forming around them. However, we are regularly told by the mobile phone industry that these base stations are safe because their microwave radiation falls off rapidly with distance and is far too low to generate significant heat. Sadly, this is not true. It is based on the false assumption that it is only their heating effect that can cause damage and a serious misunderstanding of the ways in which living organisms use negative feedback to respond to changes

in their environment, including the metabolic insults from mobile phones. There are hundreds of scientific papers in peer-reviewed scientific journals showing biological effects from non-ionising radiation that may be hundreds or thousands of times below the levels that cause significant heating (see [Bioinitiative](#)). Furthermore, these non-thermal effects include many independent and well-replicated studies showing that the radiation from mobile phone handsets can cause serious damage to the DNA of living cells in less than 24 hours, so we cannot regard these handsets as being safe for anything other than short-term use.

Because of the extreme sensitivity of at least some cells to mobile phone radiation, it is likely that the much weaker radiation reaching people living or working close to base stations will also suffer adverse effects. Claims by the mobile phone industry that the base stations are safe because the radiation falls off rapidly with distance are flawed. Although the radiation level does indeed fall off as they say, the biological response will remain more or less constant over a wide range of signal strengths due to the ways in which living cells routinely use 'negative feedback' to compensate for changes in their environment.

### **Negative feedback**

The concept of negative feedback is extremely simple. For example, if your house is too hot you turn the heating down. This not only makes you feel more comfortable, it also saves fuel. You may regulate the heating manually or you might have a thermostat that does it for you by cutting off the heat when the temperature reaches a predetermined value. In either case, the effect is the same; whenever the temperature isn't right, the thermostat tries to correct it by making the heating system respond in the opposite direction; this is termed negative feedback. Negative feedback is also very familiar to engineers in the electronics industries where it has countless applications. A simple example is the automatic gain control in some radios. This feeds some of the signal going to the loudspeaker back to the amplifier section so that if it is too loud it turns down the gain to keep the sound volume more or less constant over a wide range of signal strengths. As you will soon see, this is very relevant to the way in which the different signal strengths from mobile phones and their base stations can give very similar biological responses.

### **Negative feedback in living organisms**

Living organisms are full of negative feedback systems, where they are essential to their normal function and ability to respond to an ever-changing environment. For example, if your body finds that it has too much of a particular biochemical, it may turn down or turn off the activity of the enzyme system that makes it. This not only keeps other systems that depend on this chemical running smoothly, it also stops the body wasting resources by making a substance that it doesn't need.

### **Biological feedback and non-thermal radiation**

So how does this form of biological feedback relate to mobile phones and their masts? Put very simply, because of the extreme sensitivity of at least some living cells to weak non-ionising radiation (see [Bioinitiative](#)), the question is not why the weak radiation from a distant mast does so much damage, it is why a handset next to the ear doesn't do very much more.

The answer lies in our own negative feedback systems. The body is well able to detect the radiation and the resulting damage. It then puts into action a range of negative feedback measures to mitigate the effects. One of the most damaging effects of this form of radiation is the loss of some of the calcium that normally strengthens cell membranes (see [Non-thermal bioelectromagnetic effects explained: Why calcium and potassium effects in the research are so important](#), for a simple explanation). This results in an increased leakage of materials through cell membranes that can affect many aspects of metabolism. These include damage to DNA, from digestive enzymes leaking from lysosomes (tiny membrane-bound structures in living cells that normally recycle waste), apoptosis (cell death), the generation of false nerve impulses from calcium leakage in brain cells (causing hyperactivity, impairing normal mental function and generating many of the known symptoms of electromagnetic hypersensitivity) (see [The Biological Effects of Weak Electromagnetic Fields](#)).

### **Defence mechanisms**

#### **Calcium expulsion**

The entry of free calcium ions into living cells is normally carefully regulated and small changes in their concentration play a vital role in controlling many aspects of metabolism. These can be disrupted if electromagnetically-induced

membrane leakage lets extra and unscheduled amounts of calcium into the cell, either from the outside or from calcium stores inside. To compensate for this, there is a negative feedback mechanism that pumps surplus calcium out again, but this must be limited since, if the pumping were too effective, it would interfere with the small changes in calcium that normally control metabolism.

### **Ornithine decarboxylase (ODC)**

The activation of the enzyme ornithine decarboxylase is triggered by calcium leaking into cells and by nitric oxide produced by damaged mitochondria (membrane-bound particles that provide most of a cell's energy) [The role of Nitric Oxide](#)). This enzyme leads to the production of chemicals called polyamines that help protect DNA, and the other nucleic acids needed for protein synthesis from damage, including that from digestive enzymes leaking from lysosomes.

### **Heat-shock proteins (HSP)**

These are perhaps wrongly named because they can also be produced directly in response to electromagnetic radiation at levels thousands of times lower than that which can generate significant heat. Their job is to combine with vital enzymes, putting them into a sort of cocoon that protects them from damage, but this also stops them working properly.

### **Short-term limitations**

All of these negative feedback mechanisms are triggered by radiation-damage or directly by the radiation itself, and there may also be others that we still don't know about. Their collective role is to try to limit the damage, but they cannot completely eliminate it without disrupting the cell's normal functions. Consequently, they will be programmed not to cut in until the damage approaches intolerable levels. This effect will maintain the damage and observable symptoms close to the levels at which they cut in over a wide range of radiation intensities. Consequently, any adverse effects and observable symptoms, such as headaches and dizziness, from distant masts and local handsets may be approximately the same, at least in the short

term.

### **Long-term limitations**

Defence mechanisms against non-ionising radiation almost certainly evolved over countless millions of years to protect living organism from weak natural radiation such as the wide-band radiation from thunderstorms that we now perceive as 'static' on our radio sets. However, they are 'designed' only for intermittent use because they disrupt normal metabolism and are expensive in bodily resources and energy.

These resources have to come from somewhere. Some may be drawn from our physical energy, making us feel tired. Some may come from our immune system, making us less resistant to disease and cancer. There is no hidden reserve. As it is, our bodies are constantly juggling resources to put them to best use. For example, during the day, they are directed towards physical activity but during the night, they are diverted to repair processes and to the immune system.

Day and night irradiation from mobile phone masts (which run continuously) is likely to affect both, with little or no chance to recover. In the long term, this is likely to cause chronic fatigue, serious immune dysfunction leading to an increased risk of cancer, and many of the other symptoms frequently reported by people living close to mobile phone base stations.

There are also a growing number of anecdotal reports that the continuous radiation from DECT phone base stations and Wifi routers can have similar effects, so that these too should be considered as being potentially unsafe. We should perhaps add to these the growing use of DECT cordless baby alarms. Although to date there is no firm evidence of adverse effects, these devices irradiate the baby continuously from nearby, but the child is probably too young to report the symptoms.

In this case, a delay in the onset of sleep due to brain hyperactivity could be an early warning of potential longer-term damage that may not become apparent until later life. Even a mobile phone left switched on nearby has been shown to disrupt normal sleep rhythms in adults.

### **Why we are not all affected**

This is due to natural biological variability and is quite normal. For example, not everyone who smokes dies of cancer; it just increases the risk. Similarly, not everyone will be equally affected by non-ionising radiation. There could be many reasons for this; some people may have higher levels of calcium in their blood, which will help stabilise their cell membranes. Others may have more effective natural defence mechanisms or mechanisms that cut in at different levels. Other people may have had their defence systems impaired, by either illness or prolonged electromagnetic exposure. Many more may be affected but have just put it down to the general stress of modern living and have not yet made the link between their symptoms and their now almost universal electromagnetic exposure.

However, even if you are one of the lucky ones who suffer no obvious short-term adverse effects from electromagnetic radiation, there is no cause for complacency. There is no guarantee that you will not suffer long-term effects or that the apparent lack of effect will continue as the general levels of electromagnetic exposure rise and our steadily aging bodies become less and less able to cope.

### **What can we do about it?**

Very few people would want to give up their mobile phones, but if you have one, for your own personal safety, it is best to keep your calls on it short and relatively infrequent so that your body has a chance to recover in between times. Use text (which takes seconds to transmit) rather than voice calls and avoid making unnecessary downloads from the Internet. The choice is yours, but spare a thought for the people living near the base stations. Some of them may be more badly affected by their continuous irradiation but they have no choice. Your mobile calls will contribute to their problems, so your restraint may help them too.

### **Postscript**

At present, legislation by many governments (presumably at the request of the mobile phone operators) prevents anyone objecting to the location of base stations on health grounds, and they have been advised not to recognise the problem. I hope that this article may go some way to achieving

this much-needed recognition. The problem is far more serious than anyone has previously imagined.

I have little doubt that the mobile phone industry will seek to dismiss this article as being mere theory. Yes, it is theoretical, but I have based it on known and well-established facts, and it fits these facts far more closely than their own assertions that the only possible biological effects of this sort of radiation are due to heating and that the radiation from base stations is therefore safe. In the light of these observations, I believe that the time may now have come for an urgent and independent reassessment of the situation based on new and thorough epidemiological, biochemical and medical research on the effects on humans of chronic irradiation. In the meantime, it would be advisable to call for a moratorium on the further expansion of these wireless 'services' until the outcomes of this research become available, and safer means of mobile wireless communication devised.

*Andrew Goldsworthy BSc PhD is an Honorary Lecturer in Biology at Imperial College London.*