

# How Exposure to Base-station Radiation can Adversely Affect Humans\*

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The claim made by the Mobile Phone Industry that the microwave emissions from the antennae of a GSM or TETRA Base-station are many times lower (by at least a factor of 1000) than the limit to which the UK Government's Statutory Body – the National Radiological Protection Board (NRPB) – maintains it is safe for us to be exposed to, is perfectly true.

The current exposure limits, set by the International Commission for Non-ionising Radiation Protection (ICNIRP), are, however, purely thermally based - *i.e.* they simply limit the intensity of the radiation to ensure that the amount of tissue heating by the absorption of microwaves is not in excess of what the body can cope with. If heating were the only effect of the radiation, existing guidelines would afford adequate protection; unfortunately, however, this is not the case. For microwaves are, after all, waves, and, as such, have properties other than solely intensity. In particular, the pulsed microwave radiation used in the GSM and TETRA systems of mobile telephony has certain rather well defined frequencies, which facilitate its discernment by the alive human organism, and *via* which the organism can, in turn, be affected in a purely *non-thermal* way. This is so because the alive human organism (and only the alive one) itself supports a variety of oscillatory electrical biological activities, each characterised by a specific frequency, *some of which happen be close to those used in GSM and TETRA*. Thus, the frequencies of the microwaves (particularly the higher ones used in GSM) that carry the voice information by means of appropriate modulations are close to those characterising the highly organised electrical activities that are involved in the control of certain biological processes in living organisms at the cellular level (including processes as fundamental as cell division), whilst the somewhat lower frequencies used in TETRA facilitate deeper penetration of this radiation. On the other hand, the rates at which the microwaves are emitted in distinct groups of flashes (or pulses) are close to the frequencies of some of the brain's own electrical and electrochemical rhythms, which this makes them particularly vulnerable to interference (or even entrainment) by the radiation. [The basic 'flash rate' is 217Hz, but the flashes are emitted in groups of 25 at the rate of 8.34Hz. With increasing call traffic, the 217Hz pulsing gradually disappears, leaving only the ELF pulsation at 8.34Hz, which is in the range of the alpha brain wave activity!] It is to be stressed that unlike heating, such non-thermal influences are possible only when the organism is alive: the Dead have no electrical brain activity with which an external electromagnetic field can interfere!

What the Industry and the various regulatory bodies (such as the NRPB and ICNIRP) dispute is that the very weak, pulsed microwave radiation used in GSM and TETRA can **non-thermally** affect these various biological (electrical) activities in ways that can provoke adverse health reactions. Their difficulty in accepting this reality is due to an out-dated 'linear' mentality, within which forces the conclusion that exposure to weak radiation can entail only correspondingly weak effects, and *vice versa*. Whilst this is true in the case of inanimate systems and dead organisms, it is certainly not so either for energised electronic equipment, or for **living organisms**. For the latter, in consequence of their *vitality*, are themselves **electromagnetic instruments of great and exquisite sensitivity**, and thereby vulnerable to interference by weak external electromagnetic fields whose frequencies are close to those found in the alive organism. The situation is not dissimilar to the way in which the reception of a (turned-on) radio that is tuned to a particular frequency can be interfered with by a signal that is slightly off-station. In both cases, it is more a question of the 'information' content of a given (interfering) signal, rather than how much energy it contains (or equivalently, its ability to heat tissue). Whilst the importance of ensuring *non-thermal* electromagnetic compatibility between mobile phone radiation and energised electronic equipment (in aircraft and hospitals, and with heart pacemakers, for example) is accepted and generally respected, the same, unfortunately, does not yet obtain in the case of the alive human organism!

Despite persistent claims to the contrary by the Mobile Phone Industry, the existence of non-thermal effects of low intensity, pulsed microwave radiation is established beyond dispute, on the basis of many replicated experiments that have been performed over the last 30 years on a variety of living organisms. The results of these experiments have been published in international, peer reviewed scientific journals, and are endorsed by the 16 signatories (of international standing) to the 1998 Vienna Resolution, the only non-signatory being the head of the WHO Project on Electromagnetic Fields!

Of particular relevance is the way in which this radiation affects *brain function* – specifically, its electrical activity (EEG), its electrochemistry, and the blood/ brain barrier - and degrades the *immune system*. For these established influences are of a kind that are **consistent** with the nature of adverse health reactions reported both by some users of mobile phones and by some people (involuntarily) subject to long-term exposure to the radiation from Base-stations. For example, the radiation is known to affect the dopamine-opiate system of the brain and to increase the permeability of the blood brain barrier, both of which are medically considered to underlie headache – one of the most persistently reported adverse health effects. Similarly, the duration of REM sleep is shortened by exposure to radio-frequency radiation, whilst nocturnal secretion of melatonin is partly inhibited, both of which are consistent with reports of sleep disruption. Furthermore, the fact that microwave radiation has been discovered to target the hippocampal region of the brain is consistent with reports of memory problems and, in some epileptic children, with an increase in the frequency of seizures. The latter finding is not at all unreasonable, given the known ability of a visible light (such as a stroboscope) flashing at a rate somewhere between 15-20 times per second to provoke seizures in the 5% minority of epileptics who are photosensitive. For visible light and microwaves are both simply different realisations of electromagnetic radiation, and the microwave radiation used in GSM and TETRA similarly 'flashes' in a way that the brain is able to recognise, as has already been mentioned; unlike visible light, however, pulsed microwaves can penetrate the skull directly. Of particular concern is that the flash frequency of the TETRA signals is not only within to the range where photoepilepsy can be provoked, but is also very close to the frequency that causes the maximum loss of calcium from brain cells, thereby potentially undermining the integrity of the nervous system.

It should be noted that although microwave radiation is non-ionising – *i.e.* does not have enough energy to break chemical bonds, particularly in DNA – exposure can still cause interference with the natural DNA *repair* process, and produce chromosome aberrations and micronuclei. Such effects are consistent with the finding that exposure to pulsed microwave radiation (at intensities comparable to those realised during use of a mobile phone) promotes the development of cancer in mice that have been genetically engineered to have a predisposition to cancer, and also with the 2-fold increase in the incidence of a rare form of cancer in the periphery of the human brain (where the radiation from the handset most easily penetrates) - the laterality of which correlates with that of handset use - which has been found in a recent nationwide epidemiological study in the US. The relevance of these disturbing findings to the less intense, but often more prolonged, exposure to Base-station radiation is at present unknown, but the increasing number of reports of serious adverse effects in animals exposed to such radiation could well be valuable warning portents that should not be ignored.

It is essential to appreciate, however, that because the possibility of non-thermal influences is dependent on the organism being alive, it necessarily follows that **not everyone will be equally susceptible**, even under the same exposure conditions - susceptibility depending on the physiological state of the individual when irradiated, such as the stability of the brain's electrical activity and the person's level of stress prior to exposure. Whilst this admittedly makes the occurrence of non-thermal effects more difficult to predict than is the case with thermal effects – and hence to regulate against – *it does not mean that they can be safely ignored, or that they cannot provoke adverse health reactions in some people*, the severity of which will again vary from person to person, according to the robustness of their immune system. It is probably true to say that if the same degree of risk and uncertainty as to subjective noxiousness obtained in the case of a new drug or foodstuff, they would never be licensed. In connection with the biological noxiousness of low intensity microwave radiation, it should not be forgotten that during the 'Cold War', such radiation was used (rather successfully) by the Soviets to induce serious adverse health effects in the staff of Western Embassies in Eastern bloc countries, as well as in their children!

Quite apart from their weaker immune systems, children are particularly vulnerable because of the increased rate at which their cells divide (which makes them more susceptible to genetic damage) and their still developing nervous system - the size of their heads and the thinness of their skulls causing them to absorb more radiation than do adults. Particularly vulnerable to interference by the pulses of microwaves, is their electrical brain-wave activity, which does not settle into a stable pattern until about the age of 11 or 12 years. The use of mobile phones by pre-adolescent children is thus to be strongly discouraged, and the siting of Base-station masts in the vicinity of schools and nurseries resisted: financial gain must not be allowed to be the overriding consideration! It must be appreciated that whilst the intensity to which the Public is normally exposed in the vicinity of a Base-station is indeed very much lower than that encountered during use of a mobile phone, the **information** content of the signals is the **same**, so that they are equally potentially noxious.

To cite the examples of radio and television transmission in an attempt to support the claim that exposure to the (much less intense) radiation used in mobile telephony is flawed, on account of (i) the occurrence, in any case, of certain health problems that correlate with exposure to the radiation from these installations, (ii) the fact that, *unlike the radiation used in GSM and some TETRA installations*, this radiation is **not** emitted as pulses, in patterns that the brain can recognise, and (iii) the fact that the lower frequency carriers used in radio and TV are somewhat less biologically active than are higher microwave carrier frequencies used in GSM.

In conclusion, it can hardly be disputed that to enjoy an acceptable quality of life requires more than simply an absence of terminal disease. Adverse health effects in humans of the kinds already consistently reported worldwide – such as headaches, sleep disruption, impairment of short-term memory, *etc.* - whilst maybe not life-threatening in themselves, do nevertheless have a debilitating effect that undoubtedly undermines the general well-being of those affected, and which in the case of some children could well undermine their neurological and academic development. It should, of course, be stressed that the apparent absence to date of life threatening adverse effects on a global scale attributable to exposure to GSM or TETRA Base-station radiation is no guarantee of immunity in the long-term. For exposure to this kind of radiation is still in its 'early days' in comparison to the much longer (10-15 years) latency period of the kinds of cancers that could well be promoted or initiated in certain people.

**REFERENCE:** G.J. Hyland, 'On the Inadequacy of Existing Safety Guidelines' – [ww.tassie.net.au/emfacts/mobiles/hyland2.html](http://www.tassie.net.au/emfacts/mobiles/hyland2.html)

The GSM and TETRA systems deployed in Europe are similar to PCS/Digital in the United States.

In the U.S. human exposure to RF/MW radiation is regulated by the Federal Communications Commission (FCC) based on standards developed by the private organizations American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE). The status of the non-ionizing radiation committee at the National Council on Radiation Protection and Measurement (NCRP),