

## Response to points raised by:

### **“Trouble with TETRA” report of a joint PHMEG (Public Health Medicine Environmental Group) NRPB (National Radiological Protection Board) seminar on 25 May 2004**

**Note:** [GB] are notes supplied by Dr Grahame Blackwell a physicist, and [RB] by Rod Burman, radio engineer. Others are supplied as commentary by Andy Davidson, Tetrawatch and Mast Sanity member. Black unindented text is original and unchanged.

In early 2004, NRPB were contacted by a number of CCDCs who were responding to public concerns about TETRA (Terrestrial Trunked Radio) and other telecommunications masts. The focus for public concerns seems to be changing from cancers towards more diffuse symptoms. HPA is being asked to comment on levels of symptoms in the community and whether the masts pose a significant risk to public health. PHMEG offered to host a seminar to provide an update on the scientific evidence from NRPB, share local experiences and strategies to deal with these problems and give an opportunity for mutual learning.

The reason for the apparent change in emphasis is that people living in the vicinity of masts are no longer just concerned about unseen but feared long-term health effects. These remain, but what is happening is that a number of diverse but typified adverse symptoms are appearing in the population, often almost immediately upon activation (not erection) of (especially TETRA) masts.

The seminar was a great success, 35 people attended.

The group began by discussing expectations for the day. These included:

1. What is pulsing, do TETRA systems pulse?
2. Is there really a public health problem?
3. What is electrical hypersensitivity?
4. Practical strategies for dealing with public concern
5. Where do we go from here?

### **The physics of mobile telephony, similarities and differences of the TETRA system**

Simon Mann, NRPB explained that all cellular radio systems are designed to work with minimum power so that the frequencies can be re-used short distances away without interference. Masts are placed to give the most even possible signal over the coverage area. The signals are affected by the buildings and other features of the environment. The signals penetrate poorly into concrete and other obstacles that contain high levels of water.

The personal exposure from using a phone, which can approach the international exposure guidelines, is thousands of times greater than the exposure from phone masts.

But the exposure is short-lived, whereas living in the vicinity of a mast or masts is continuous, and in the case of TETRA, undiminished night and day.

Capacity is the total number of calls that can be made at the same time through a base station. Mobile phone base stations have higher capacity than TETRA systems, but TETRA aims to provide more complete and reliable coverage.

Each TETRA handset sends a pulsed signal (one time period on, 3 periods off), so that the base station can receive a constant signal as the sum of the pulsed signals from 4 mobiles.

The TETRA base station sends a continuous signal and each mobile selects the quarter of the total information that it wants. When no mobiles are listening, the base station transmits dummy data. While the base station is transmitting, the amplitude of the signal varies greatly, except for a brief period when the amplitude stabilises, but does not drop to zero. The power during the period of stable amplitude is equal to the average power at other times and so this is not pulsing. It is merely a period when the signal amplitude becomes less variable. Therefore, there is no reason to treat TETRA base stations any differently to ordinary mobile phone base stations.

If for the sake of clarity, we use the waveform in the AGNIR report (p.68), you will see that whether the modulation is amplitude or pulse or anything else there are nevertheless discontinuities in the transmitted signal. Although a Fourier analysis of the power spectrum states that the power component at 17.6Hz is only 0.327% of the total power, I do not believe that the human brain acts as an FFT (Fast Fourier Transform) analyser. In fact as far as the brain is concerned the transition from an 18KHz amplitude modulated burst to continuous carrier during the FCCH period does represent a pulsed signal having a 70.5Hz and more importantly a 17.6Hz component. [RB]

If the intention here is to inform rather than to obscure, why were delegates not being told that between time-slots the signal regularly drops to near-zero. The variation in amplitude is more than enough to provoke an epileptic fit if this were in the visible spectrum. One can only infer from this that the NRPB do not want PHMEG members to know the significant characteristics of this waveform. [GB]

Can we take it that, despite the fact that the term 'pulse' is used by every medical doctor, and despite the fact that this is where every lay-person gets their understanding of the word 'pulse' from, the human cardiovascular system does not in fact pulse because the pressure in that system doesn't fall to zero? Can we also then take it that the NRPB is advising PHMEG to cease referring to 'taking their pulse', 'having a weak/strong/irregular pulse', 'their pulse racing', 'the blood pulsing through their arteries' and all similar expressions? [GB]

Distance from a phone antenna (conventional or TETRA) is not a good proxy for signal strength because of the reflection of signals around the environment. An experiment which relied on measures of personal exposure would have to include use of phones and exposure to signals from other sources, e.g. broadcast radio and television, throughout the day.

A question was raised about the potential of TETRA to cause television interference. Interference matters are the responsibility of Ofcom, which has produced a note on the topic. Interference with TV sets is no indication of a hazard posed by RF signals in the environment since TV tuners are designed to be very sensitive in order to receive the weak signals found at large distances from the broadcast masts.

In answer to a question about the effect on exposures of adding additional antennas to an existing mast, Simon explained that public exposure levels near mobile phone masts tend to be so low that adding a further mobile phone or TETRA operator to the mast would not alter the situation. Exposures would remain small fractions of guidelines. As an example, if two signals each produce an exposure contribution that is 1000 times below the ICNIRP guidelines, the exposure produced by both signals acting together is still 500 times below the ICNIRP guidelines.

- (a) No account is taken of constructive interference, hot spots etc.
- (b) No account is taken as to whether particular frequencies affect the human body
- (c) No account is taken of pulsed signals (see above, and GSM and UMTS do also pulse) or of the pulse frequencies
- (d) The argument only applies to the thermal effects of static microwaves, since the premise is that ICNIRP guidelines tell us the whole story. There is huge discrepancy of scientific opinion as to the validity of ICNIRP levels. The chief concern is that biological effects are clearly taking place as a result of non-thermal effects.

NRPB does not have any details about whether the TETRA system is meeting its performance objectives. These issues are for government.

Whilst this is not a concern of either NRPB or PHMEG, it is apparent that the system may have to be greatly enlarged in terms of available masts to achieve any meaningful data transmission and full coverage. That then becomes a material factor to PHMEG, along with the massive proliferation of UMTS (3G) masts. We are talking about rapidly increasing density of transmitters without precaution or evaluation.

### **The biology of mobile technology and possible health effects**

Zenon Sienkiewicz, NRPB explained that TETRA is probably not a threat to health. The intensity of public concern is a little surprising given that research going back over 30 years has failed to demonstrate convincing evidence of any increased health risks associated with exposure to radio frequencies at environmental levels and the similarity of mobile telephony to other well accepted technologies.

This throwaway doesn't hold up under inspection. The only research of relevance specifically to TETRA is that on calcium efflux at around 16 Hz – see comments on next quote. Also, how does one 'explain' that something is 'probably' not a threat? 'Probably' implies a personal opinion, not an explainable fact. [GB]

Most of the 30 year research referred to has been carried out using continuous wave (CW) or frequency modulated (FM) or amplitude modulated (AM) signals. Complex digital pulse modulated transmission techniques have only really proliferated during the last 10 years with the rapid growth of cellular telephone systems and I doubt whether much of the research done to date has concentrated in these areas. [RB]

The basic biology gives few clues to possible adverse outcomes so it is difficult to know what outcomes to study. Over the years, many studies have been performed looking at a wide range of outcomes (including cancer, reproduction, electrophysiology, and cell physiology). Except for the heating effects at high field

intensities, no reliable biological (animal or cellular) model for radiofrequency exposure has been found.

We are in a whole new ball game (subjecting people to periodically-varying soft microwaves for hours/days/years at a stretch). One might well expect new phenomena to appear. Are the NRPB saying (as they appear to frequently) that if they don't know the explanation then by definition the effects do not exist? Find me ONE scientist that knows HOW non-local effects occur in quantum physics – but EVERY credible quantum physicist acknowledges the existence of those effects. [GB]

There are reports suggesting effects may occur but in general, the better-conducted studies tend to find fewer effects.

This is a very subjective observation. Should that not read "the studies that found no effect were considered (by the NRPB) to be better conducted (for that reason)"? [GB]

Effects found in one study may not be replicable either by the same scientists at a later date or by another research group. Reproductive and development effects are comparable to effects from heating, but if there is no heating, there are no effects. The overall summary of the evidence is that there is no proven biological effect from exposure to the radiofrequency fields associated with mobile telephony at the levels to which the public are exposed.

ONE overall summary, by the NRPB and similar groups concerned to protect the status quo (i.e. Government and commercial interest). Reputable peer-reviewed research on both (a) weakening of blood-brain barrier and (b) reduction in nighttime melatonin production show effects without heating (contrary to assertion above) – it's notable that both of these effects established by quality research correspond to symptoms around masts (a) headaches and nausea, and in the longer term Parkinsons and Motor Neurone Disease; (b) sleep disorders and in the longer term cancer). [GB]

The idea that no heating means no effects is a massive assumption. Recent studies suggesting 30% impairment of fertility in men from carrying mobile phones in the pocket is not shown to be a thermal effect, for example. Many reports of Frey effect ("microwave hearing") from mobile masts and TETRA in particular cannot be due to heating (see ICNIRP), yet this is the common explanation of Frey effect.

The MTHR (Mobile Telecommunications and Health Research) programme is jointly funded by government and industry, under the aegis of an independent management committee. The Home Office is also funding research into the possible health effects of TETRA in police staff.

There are no epidemiological studies of TETRA base stations, save one long-term study of cancers in children. There are no human studies of effects of TETRA other than Imperial College on police staff. There has been no attempt to respond to the complaints of people living near TETRA, to determine the reality of symptoms, the correlation in space and time, the combination of masts, the age of susceptibility of individuals *etc.* Therefore any suggestion that there is substantial government research into health effects from TETRA is quite disingenuous.

In answer to a question about whether the Stewart report overstated the possible risks of 17 Hz, Zenon replied that the balance of evidence has probably changed since the publication of the Stewart report and this was reflected in the recent AGNIR (Advisory Group on Non-ionising Radiation) report. NRPB (now chaired by Sir William Stewart) will be producing an updated statement on the health risks of mobile telephony (including TETRA) in the autumn.

Why 'probably'? Either it has or it hasn't. Another non-scientific throwaway – so let's throw it away. Since the Stewart Report there have only been two well-publicised further studies on this subject, one in 1999 (as recorded in NRPB Report on TETRA, 2001) and one very recently at DSTL Porton Down. The latter study is not a true replication attempt as it fails to address three key factors highlighted by previous researchers – temperature, background magnetic field and power windows. The balance of evidence, previously 8-4 in favour of this effect, cannot therefore be considered to have changed – probably or otherwise. [GB]

### **The prevalence of symptoms in the community**

Simon Wessely (Institute of Psychiatry/King's College London) explained that symptoms are "the stuff of life", common and compatible with normal health. There are a finite number of common symptoms with very high prevalence in the community. There is a strong correlation between fatigue, other common symptoms and anxiety/depression. Most symptoms are not associated with structural changes or disease but the symptoms are real. It is a paradox that as objective measures of health improve and people live longer, then they report more symptoms. Medicine gets better at dealing with disease, but has not really addressed symptoms.

From the research I have done in the vicinity of a number of Tetra base stations on the Isle of Wight and in Hampshire and West Sussex, it would appear that a certain percentage of the population is especially sensitive to microwave radiation carrying Tetra type modulation and these individuals have displayed symptoms such as headaches, sleeplessness, tinnitus, nose bleeds, skin rashes etc. These are symptoms which are often associated with exposure to low level microwave radiation.

Whilst it is not possible to state categorically that these ailments are related to the individual's proximity to a Tetra base station, I have seen a sufficiently large number of cases to convince me that for those especially sensitive people it is more than just imagination. [RB]

It is a quite fantastic and unscientific leap to assume that since headaches, nosebleeds or abrupt waking can be caused by many things, TETRA base stations cannot cause them.

What sort of anxiety it is that causes animals around the mast at Drumcarrow (Fife) to have such exceptional symptoms, including cancer? This might be compared with the case of cattle in Bavaria that were the subject of a much quoted study on milk yields and behaviour when moved close to and away from a communications mast. Do animals suffer psychosomatically from masts? Maybe they do, but again it deserves proper research not dismissal as anecdote (see below).

The fact is that very many people suffer adverse effects from TETRA masts who have no previous anxiety about it at all. They have lived with mobile

masts for years, they know nothing about TETRA, they do not know when it has been switched on, except that they experience unusual (for them) symptoms. The only anxiety they have is a result of the symptoms, and were they not to be anxious this would itself be extremely unusual. The desperate attempt to "allay fears" would seem to be based on an unscientific presumption that once calmed, these symptoms will disappear.

There is an increasing tendency to attribute symptoms to environmental causes. The symptom spectrum remains the same but symptoms are ascribed to causes that are described as "not my fault", "modern" or "external". Examples in the scientific literature include a US paper describing an outbreak of symptoms in a community who found that they lived near to a toxic dump. Eventually it was revealed that the dump did exist, but was actually some distance away. Therefore, the symptoms were due to knowledge and anxiety, rather than toxins.

"The dump that wasn't there" could have been used by the tobacco industry to indicate that cancer and heart disease attributed to passive smoking is due to psychosomatic causes. Certainly it could, if the subsequent research had not been done and been accepted. The dump example is simply an example of psychosomatic symptomatology, it does not inform any other situation about its correlation and causality.

### **Local experiences**

David Hagen, CCDC, Haydn Smith, Assistant Director (Health & Housing) and James Appleton, Assistant Director (Planning), Worthing Borough Council explained that "The trouble with TETRA is that it does affect people's health. The masts are symptom magnets".

In 2001 a BT Cellnet base station was erected at Downsview, on the Felpham Golf Course in West Sussex. It is only a few metres away from the houses, and very prominent above the tree line. It is one of the stoutest masts you could imagine with an enormous metal cabinet.

What is special about it? For three years it is a monstrous presence, but the antennae are only dummy. They do nothing. What a prime site for psychosomatic effects. But nothing is experienced.

On 12 June 2004, engineers arrive at the site and replace the antennae with antennae that look almost identical. They are not the usual TETRA-looking antennae, there is no forward planning notice, there are no new signs on the enclosure. In fact to all visual intents and purposes nothing has changed. Even the original A4 notices of completion from 2001 (no longer required) are undisturbed.

But local residents start complaining straight away of headaches and nosebleeds. There is no other mobile technology in the vicinity.

Anxiety? A magnet for symptoms? Very unlikely. So for what reason should this locality not be surveyed?

Eleven children in a school in Littlehampton in the main beam of TETRA (applied to an existing mast) suffered severe symptoms the day the mast was switched on without anyone even knowing it had been.

The mobile telephone companies have not helped because of lack of public consultation and inconsistencies in the planning laws, for example a tall mast can be erected at the end of the garden, but the householder may not be permitted to erect a potting shed. There is less obvious public benefit to TETRA systems than conventional mobile phones.

It really isn't a case of feeling a mast is not necessary, nor is it the height or presence. Often antennae are added to existing structures. But the feeling that particular transmitters, such as TETRA, are causing a very real physical effect does highlight the complete absence of any protection, defence or support from any of the protective authorities and agencies. All they are offered (at the kindest) is a pat on the head and a patronising "it's all in the mind".

Local authority officials are in the front line because they are responsible for implementing planning laws at local level. Planning refusals often incur large costs for local authorities because the operator invariably appeals, and often wins on appeal. This makes the council seem ineffective and weak. The Worthing team presented the great pressure they were under to measure symptoms in local residents that are attributed to a TETRA mast. There are plenty of websites and self-appointed experts that reinforce the notion that the existing science is ignoring the "real" health effects. Authorities are accused of hiding a substantial risk because they do not say that masts are "definitely safe". The media are keen to report this debate. The public view is that the "easy experiment" of turning the mast off to see if the symptoms disappear is valid and should be done.

The biggest obstacle to experimentation is ethics. Where a mast is erected amongst housing without consent, and where problems are experienced, residents are completely defenceless and without recourse to either law, consideration or common sense. Were the same device to be installed in the same place in order to see if people experienced problems, it would be refused unless every man woman and child gave consent for the experiment.

The biggest obstacle to evidence is the refutation of the observed. Where masts have been turned off temporarily, have been sabotaged, and have been switched off more or less permanently, indeed the symptoms attributed to that mast have declined and disappeared — even when such cessation has not been notified. But the "official" response in every case is not that the mast was a cause in any way, but that it must still be wholly psychosomatic. This is scientifically an entirely unreasonable supposition, since it *a priori* denies any outcome other than that presupposed. Furthermore, if the erection of masts consistently causes psychosomatic effects, this by itself should be regarded as socially unacceptable. We deal in law with the fear of endangerment to life, and it has as much weight in legal judgement of threat as proven intent.

We do not need "definitely safe". A confidence level of 99.99995% certainty that it's safe – not less. That's good, precise science, such as we expect from a supposed scientific body like the NRPB. We really must not settle for "on the balance of probabilities it's safe", as we keep hearing. This is the same as saying there is real doubt. If 100 people cross a particular road, 49 of them get knocked down and 51 of them cross without incident, then on the balance of probabilities it's safe to cross that road. [GB]

"Unlikely to cause harm to the general population" is also the same as saying that some people could well be affected. A drug therapy that is not 100% safe is either not licensed, or comes with warnings so that susceptible patients avoid it. Masts cannot be avoided and cannot be refused, but they are not 100% safe, and even the side effects are not properly attested, recorded and provided as information. Would this leaflet on a mast be acceptable:?

*"Warning, this microwave transmitter may cause headaches, nosebleeds, rashes and disturbed sleep patterns. If you suffer electrical sensitivity, epilepsy or ME, you are advised to move house away from all such transmitters. If on living with this transmitter you appear to experience these symptoms, cease living near it straight away and see your doctor immediately."*

### **HPA Chemical Hazards and Poisons Division, introduction to the draft guidelines for the investigation of suspicious or alleged clusters with potential exposures to environmental chemicals**

Jill Meara on behalf of Pat Saunders, HPA ChaPD explained that the brief is to produce guidelines for the investigation of suspicious or alleged clusters of diseases with potential association with exposures to environmental chemicals for local authorities and primary care trusts. Many cluster investigations do not yield positive results but inappropriate refusal to conduct a study can also cause problems. There is a major challenge to allay community concerns without seeming to avoid the issue.

It would appear to be inappropriate to begin with the premise that any demand for investigation is unfounded on grounds that causality is unknown. It is equally inappropriate to regard the challenge as being one of "allaying fears" before the correlation and causality of any particular location is fully determined. Fears were "allayed" in the cases of tobacco, asbestosis, CJD and power lines for as long as the mechanisms of injury were unknown or unproven. And in the cases of tobacco and power lines, decades have passed by whilst people died with their fears allayed.

We should not have to prove cancers and motor neurone disease before anyone listens to the serious discomforts of headaches, sleep disorders and nosebleeds (for example). These by themselves deserve proper attention. Electrical hypersensitivity is not properly recognised in the UK, and its connection with masts is being actively avoided.

The draft guidance reviews several existing guidelines for cluster investigation and proposes a set of guidance for the HPA. The guidance proposes a staged approach starting with screening and incorporating review at the end of each stage. The guidance is currently being reviewed by experts, it aims to give HPA staff the right method at the right time and the confidence, if appropriate not to conduct a study.

Denise Catney and Anna Gavin from the Northern Ireland Cancer Registry/Queens University Belfast have recently published an investigation of an alleged cancer cluster near a telecommunications mast in the province.

Using software that maps mast beam and radiation intensity onto geographical topography, other researchers have plotted cancers house by house in locations where clusters have been alleged. There is a correlation

of greatest occurrence in the areas of greatest exposure. Just two examples can be found at <http://www.tetrawatch.net/science/plots.php>. This exercise should be being done independently and thoroughly for each of the many alleged clusters in the country. It is not good enough to say that cancers of different kinds cannot be regarded as a cluster, and therefore not to investigate further. On these grounds, testicular and breast cancers with the same cause would always be refuted as belonging to a cluster. Yet this argument was presented to the All Party Parliamentary Mobile Group in April 2004.

### **Experiences of talking about mobile phone masts at public meetings and dealing with “mavericks”**

Mike Clark, NRPB said that early public concerns were about the handsets, now they are all about the masts. Public concern is very variable around the country. Mike described some successful methods to explain the science to the community. For example:

- Compare the devastating health effects of the early researchers into radioactivity with the lack of damage to early radio pioneers such as Marconi.
- Explain that a few seconds talking on a mobile gives the same exposure as a day living near a mast.
- Give a clear description of the hierarchy of scientific evidence (anecdote to randomised controlled trial).

Concern about masts has risen with awareness, and with adverse symptoms. It would be presumptuous to say that symptoms have risen *because of* awareness. I would not know that hayfever was not a summer cold, if I did not know I was sensitive to particular tree pollen, for example. Just because I know about pollenosis does not mean my hayfever is psychosomatically induced.

We know ionising radiation is harmful. That does not mean that something that might be more subtly damaging is not harmful.

We dealt with pulsing above; delegates should have been made aware that amplitude between signal bursts falls to near zero, so a coherent extremely low frequency can indeed be experienced by the human body.

It is inaccurate to say that whole body exposure to mast radiation 24 hours a day every day of the year can be compared with short application of a mobile phone to the head, especially since the issue is not regarding thermal effects and the validity of ICNIRP guidelines in any case. Comparing ICNIRP thermal guidelines of one device with another does not address the concerns about more subtle biological effects.

Sound research and solid findings are frequently initiated by anecdotes. From there a hypothesis is formed and tested, then replicated and peer reviewed. It is entirely inappropriate to dismiss any evidence as anecdotal. Rather it should be embraced as an indication of required study.

Mavericks. [GB]

Is the earth flat? No. Who told us? Maverick scientists.

Is the earth the centre of the universe? No. Who told us? Maverick scientists.

Does combustible matter contain phlogiston, a substance that has negative weight? No. Who told us? Maverick scientists.

Does light travel through space in a substance referred to as 'the luminiferous aether'? No. Who told us? A Maverick scientist called Albert Einstein.

When did the NRPB get around to acknowledging that overhead power lines pose a health risk? 31st March 2004. How long have some of these Maverick scientists been saying that? For ten to twenty years.

As one who was referred to as a 'maverick scientist' by Mike Clark at a public meeting, I too can give you a few characteristics of 'maverick' scientists:

- (1) They hold well-founded opinions differing from those held by the NRPB.
- (2) They make reference to quality research that Mike chooses not to know about.
- (3) What they say appears to make more sense to audiences than what Mike says. (That last is not my opinion, it was a view expressed by a member of the public at such a meeting) [GB]

### **MTHR funded research on the effects of mobile phone use on symptoms and neuroendocrine function in "normal" and "hypersensitive" users.**

James Rubin from King's College London said that hypersensitivity to mobile phones does not have a common set of symptoms, prevalence or triggers. A systematic review of previous studies found 30 blind or double blind studies. 24 were negative but of low power, 6 were positive (i.e. found a link between radiofrequency exposure and symptoms in susceptible individuals). Of the 6 positive studies, 2 were not positive on replication, 2 were statistically unreliable and 2 gave mutually inconsistent results. There is no consistent pattern of symptoms reported or believed triggers. There appear to be strong cultural determinants to which symptoms are expressed. James is doing a study, funded by the MTHR programme that will recruit 60 hypersensitives and a similar number of controls for double blind testing.

Regarding the "Trouble with TETRA", we are not talking about hypersensitivity to mobile phones. No research is even being entertained regarding investigation of such sensitivity (if that is what it should be called) around TETRA masts. This submission is entirely spurious, since the symptomatology of TETRA is most certainly consistent in its pattern, even though there is diversity within the set of symptoms.

### **How do you predict which new technologies are likely to arouse public concern and which will just wrap tomorrows chips?**

Why not ask how to determine scientifically when concern has foundation and when not? It is just as wrong for scientists and health professionals to suppose that new technology is harmless as for ordinary folk to assume that new means risk.

Some "fright factors" can be identified including risks of dread diseases, lack of benefit to individuals etc but there is also a random element. It is clear that in some cases masterly inactivity from authorities is followed by low levels of public concern, but in other cases the scare is amplified and authorities end up on the back foot.

That the Trouble with TETRA is mainly or wholly a "scare story" is a regrettably unprofessional approach. It is tantamount to assuming that those who say they are affected (and their reports are remarkably similar, even when completely uninformed about the concerns in other areas) are intellectually challenged and less able to assess their own situation than those in positions of responsibility, such as represented at this seminar.

In the case of TETRA masts, actions that may have led to high levels of public concern include:

- Erecting masts in the middle of the night
- Unwillingness to talk by companies or local authorities
- Mixed messages or wrong information
- Profits for big businesses
- No perceived public benefit

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