

## Summaries of speaker presentations at a THG seminar held in London on 14 March 2008

*The seminar on 14 March included presentations on The Sheffield Mobile Phone Blood Pressure and Cardiovascular Study, and the studies in progress on electro-sensitivity to the signals from TETRA handsets and base stations at Kings College London and the University of Essex respectively. The summaries here were prepared from notes taken at the seminar and have been agreed with the speakers.*

### **Professor Tony Barker – University of Sheffield**

#### Background

- Stewart report recommended further scientific work
- The work is funded by MTHR
- Sheffield undertook a human volunteer study

#### Why this study?

- In the Lancet (1998 351:1857) Braune et al suggested that resting blood pressure (BP) increased during exposure to RF – they observed a 5-10mmHg increase
- High BP can lead to stroke, heart attack, renal failure etc
- Stewart recommended a larger and better defined study on both GSM and TETRA
- Since then there have been 3 published studies:
  - Braune (Journal Radiation Research 2002 158(3):352-6) which found nothing
  - Tahvanainen (2004 Bioelectromagnetics 24(2):73-83) who looked at GSM and saw no effect
  - Sheffield study (Bioelectromagnetics 2007 28(6):433-438)

#### Methodology of the Sheffield Study

- Standard MTHR handsets were calibrated to deliver  $1.4\text{WKg}^{-1}$  (which is within ICNRIP standards)
- Study performed double blind
- Three types of RF wave administered
- Modulated signal to antenna
- Carrier wave (same average power but with no modulation)
- Sham with no RF power to antenna
- Each subject was exposed to the 3 types for both GSM and TETRA in a randomised order of exposure
- The primary measure was MAP (mean arterial pressure) which is defined as diastolic pressure plus one third of the difference between systolic and diastolic and is a standard measure used in medicine
- BP was measured for 24 hours following exposure using an ambulatory monitor
- Sympathetic nervous system activity was also measured using as proxies:
  - catechol (adrenaline and nor-adrenaline) levels in the blood via a blood test

- variability of the heart rate
- Heart rate was monitored using a chest band which sent measures via a telemetry system to the computer
- The study size was set to detect changes in MAP of 2mmHg (less than the changes Braune claimed he had found)
- To produce reliable results the study needed more than 100 subjects – 125 were recruited and only 5 dropped out (the largest previous study had 32 subjects)
- The volunteers were in the age range 18-65 but predominantly at the younger end of the range, with 77 female and 43 male
- Handsets were held in a standard position by means of a headset
- Each subject visited the lab 6 times, typically one week apart, getting one type of exposure on each occasion in a random order
- The subject watched *Blue Planet* on TV during the exposure sessions
- There was a twenty minute run in period during which blood pressure and heart rate were measured, then a blood sample was taken, then the handsets were turned on for 40 minutes with blood pressure measures being taken at 5 minute intervals
- A second blood sample was taken at the end of the period and the ambulatory recording device was fitted

#### Data Analysis and Presentation

- The data were analysed using ANCOVA (co-variance analysis) with the run in data as a control to reduce inter-subject variability
- The results were depicted graphically, with 95% confidence limits (that is, with 95% certainty that the 'real answer' lies between the two limiting bars on the graph above and below the result point). The closer these limiting bars are the more reliable the result.

#### Results

- No significant difference was found between the different types of exposure for:
  - Nor-adrenaline
  - Adrenaline
  - Heart rate variability (low frequency band)
  - Heart rate variability (high frequency band)
  - Heart rate variability (low to high ratio)
  - MAP (the ranges here were very small as there were 16,560 measurements)
- The GSM sham MAP was 0.7mmHg lower than the other exposures which is just about statistically significant but does not appear to be RF related as the TETRA sham did not show the same effect.
- Ambulatory blood pressure varies with daily activity so the variation in results was a little greater but there was no significant difference between the 6 types of exposure

#### Explaining the results

- Measuring the average handset battery consumption suggested the GSM sham gets around 1 degree hotter on the surface due to the internal configuration which may account for the GSM sham result

#### Drawing conclusions

- GSM and TETRA signals have no effect on blood catechols or MAP

- There is a small effect for GSM sham exposure which is possibly due to the slightly hotter surface of the handset or due to chance (a 1:25 possibility that this result is just due to chance)
- We can rule out with a high degree of certainty the occurrence of blood pressure changes linked to RF exposure as described by Braune.

#### Postscript

- If poorly-designed studies get published in high profile journals the media pick them up and the public gets alarmed
- Either the findings remain on the record or people spend a lot of time and money trying to replicate them. The usually negative results which are found are less likely to be picked up in a high profile journal
- A possible solution to enhance the robustness of published studies – perhaps the scientific community should impose sanctions on scientists and their institutions if poor quality work is published which subsequently fails replication – a vested interest in quality rather than number of publications needs to be created.

#### **Presentation by Denise Wallace – University of Essex**

*The slides used by Denise Wallace are also available [here](#).*

#### Background

- Potential health effects from base stations create public concern particularly from those who claim hypersensitivity to RF
- Stewart report recommended precautionary approach pending further peer-reviewed research as research had not kept pace with wireless developments
- Evidence indicates that there is no causal link between ambient RF and symptoms experienced by those who claim to be hypersensitive
- Hypersensitivity is not a recognised medical condition – WHO labels it "Idiopathic Environmental Intolerance with Attribution to EMF"
- Continued pressure from action groups to investigate potential biological effects of RF (eg Sweden has an Association for electrically and VDT injured)
- Suggestion TETRA frequency components might have a health impact

#### The Study

- Aim is to determine whether electro-hypersensitivity (EHS) symptoms are related to TETRA EMF exposure and whether those who do not exhibit symptoms are affected
- Double blind provocation study
- Looks at physiology, psychology and health
- Self-described sensitive group with matched control group
- Funded by MTHR

#### Methodology

- Screened laboratory established at University of Essex
- TETRA base station system developed and installed by RedM
- Study conducted by a multi-disciplinary team (including medicine, physics, bio-engineering, cognitive and experimental psychology)
- Randomised double blind trial where subjects are exposed to a signal or sham while performing a variety of cognitive tasks. Physiological measures also made.

### The Signal

- Release 1 TETRA (as used by emergency services) signal
- TDMA frame structure; 4 time slots per frame on a single carrier, with signal properties modelled on Airwave
- Timeslot occupancy 50:50 used to get frequency correction channel in balance as TETRA wave form has marked differences depending on the traffic being carried

### Testing Room

- Reception area and testing room lined with metallic fabric to keep signal in and everything else out
- Absorber installed to ensure everyone gets same exposure
- Subjects all watched *Planet Earth* for part of the session
- Comfortable reception room with refreshments

### Data Collection

- Data collected over 3 sessions
- Session 1 – open provocation – both the subject and the researcher know what to expect and when
- Sessions 2 and 3 performed double blind
- Protocols used for sessions to ensure consistency
- Tests such as pattern glare to test for migraine susceptibility included
- Session 1 involved:
  - 15 minute TETRA and sham signal exposure separated by a 2 minute 'wash out' (no signal at all)
  - Participants report how they are feeling at intervals using questionnaires, (eg levels of anxiety, fatigue)
  - Base line tests performed for concentration and short term memory
  - Physiological indicators such as blood pressure, heart rate and skin conductance measured during exposure (indicators for stress levels)
  - There are 4 lots of 5 minute exposure (separated by 2 minute wash out) to see if participants could tell TETRA from sham
- Sessions 2 and 3 are treated as a set -50 minute exposure to one unknown exposure condition (TETRA or sham) with cognitive tests and mental pressure test conducted during exposure
  - Subjects watch *Planet Earth* for 20 minutes
  - Then undertake mental arithmetic and memory tasks for 20 minutes
  - Debrief is followed by questionnaire and symptoms are tracked over the following 6 days

### Results

- Work is yet to be completed but results will report
  - whether people can detect the signal
  - whether the signal has an effect on their physiology
  - whether it has an impact on their wellbeing.
- Testing continues until October and the project is due for completion by the end of 2008
- Volunteers who describe themselves as 'sensitive to RF' are still being sought

## **Presentation by Dr James Rubin – Kings College London**

The slides referred to in this summary are available separately [here](#):

Slide	Notes
1	<p>Research is being conducted at King's College London to test whether exposure to weak EMF can trigger short-term subjective symptoms (e.g. headache, nausea, fatigue etc), and to test whether some people are particularly sensitive to this effect.</p> <p>Funding provided by Mobile Telecommunications and Health Research Programme – itself jointly funded by industry and Dept of Health.</p>
2	<p>Discussion of the health effects of weak EMF and RF needs to recognise that there is one well-established mechanism through which RF can have a biological effect – by heating you. As RF is absorbed by body tissues, it heats them. If that heating reaches a certain threshold, biological changes start to be seen. But systems currently in use are designed to keep any power emitted many times lower than the amount needed to trigger these clear cut effects.</p>
3	<p>Research looking for a health effect from these kind of signals rarely finds anything</p>
4	<p>An undercurrent of concern exists in the UK that these systems can affect health. Some people claim they are sensitive to RF and suffer adverse reactions every time they are near a mobile phone for example, or a mast, or a computer.</p> <p>When pressed as to what the specific thing is that is of concern, people normally point to the unnatural pulsing characteristic of modern signals as the key non-thermal feature that might cause an effect. The argument runs that these digital pulsing signals have not been around for long enough for us to know what effects they may have.</p>
5	<p>When asked for evidence that the signals can have health effects, people sometimes point to the existence of a condition called electrosensitivity. A condition in which people describe that they are essentially allergic to modern electrical devices, experiencing clear cut adverse symptoms when they are near to them.</p>
6	<p>This condition is incredibly heterogeneous. Ten people who say they have ES can give 10 completely different descriptions of how it affects them. Surveys show that all sorts of symptoms from headaches and fatigue to hair loss and sleep disturbances.</p>
7	<p>The stimuli people report as problematic are also heterogeneous. More common stimuli include mobile phones and radio handsets. But they also include virtually any device that has an electromagnetic field. And they don't even need to be man made – some believe that the weather, or daylight, or even 'geopathic stress' cause symptoms and use the same descriptive label.</p>
8	<p>Likewise, prevalence in different societies is heterogeneous varying between 1.5% and 8%. But these surveys only tell half the story, because they are only done in countries where researchers think there is already an issue. In Iran, for example, clinicians there have never even heard of it.</p>
9	<p>For most people, the condition is troublesome and bothersome, but they can work around it. If mobile phones give headaches, avoiding them can bring relief, at least in the short term. But for a minority, and conventional wisdom is about 10%, the condition is much more severe. These are the people who can no longer work because</p>

	<p>of it, who have difficulty leaving the house or seeing friends or family, or who have to up sticks, leave modern society behind and try to find an isolated part of the country where they will be safe.</p>
10	<p>We have tested for the condition with results published in the British Medical Journal in an article entitled "Are some people sensitive to mobile phone signals: within participants double blind randomised provocation study" by G James Rubin, Gareth Hahn, Brian S Everitt, Anthony J Cleare and Simon Wessely.</p>
11	<p>In this study we were particularly interested in people who reported being sensitive to mobile phone signals and wanted to test whether we could observe this effect in the lab.</p> <p>2 groups of people were invited to take part in an experiment. The first group was a group of 60 people who all reported being sensitive to mobile phones and described getting noticeable headaches within 20 mins of using one. (In fact, mean time to headache was only around 7min). The second group was a group of 60 healthy controls.</p> <p>Each participant came into the lab on 3 separate days and was exposed to three things – a GSM mobile phone signal, a non-pulsing signal, and a sham condition with no active signal. Each exposure lasted for 50 mins. The order in which people got the 3 sessions was random for each person. And crucially it was double-blind – ie the subjects didn't know which was which, and the researchers didn't know which was which.</p> <p>During each session, subjects were asked to fill in a symptom questionnaire, describing and rating any symptoms that they were experiencing.</p>
12 & 13	<p>The subjects wore headgear designed to hold the handset generating the signal in the same position throughout the exposure.</p>
14	<p>The key results showed that in the sensitive group the symptoms increased as the session proceeded, until the headset was removed at which point symptoms start to return to baseline.</p> <p>The sham session was just as likely to trigger these adverse symptoms as the two sessions where a real signal was used.</p> <p>The control group did not experience anywhere near the same level of symptoms</p>
15 & 16	<p>The Kings College London team has also published a detailed review paper of every previous study that has examined this issue using the same type of blinded experiment - 31 of them. And over-all, they support our key conclusion. People with electrosensitivity do get symptoms in these experiments, but the sham sessions are just as likely to trigger them as the ones using a RF signal.</p>
17 & 18	<p>Of course, not every possible type of signal has been tested in this literature, so people will be able to say that no research has been done on the very latest type of signal or exposure, The key question is whether any new exposure is sufficiently different to make it worth studying afresh. In the case of TETRA there are those who argue that that is the case due to the signal pulsing at a frequency close to the frequency where previous research hinted that there might be a biological effect. Because of that, we are now in the process of repeating our study, but this time using the Airwave TETRA signal instead of GSM, and also using police officers who report short term adverse effects from Airwave as our sensitive group.</p>
19	<p>Progress on this has been good. It is always very difficult to persuade people to take part in this type of study. If you think a certain signal is harming your health, often</p>

	<p>the last thing you want to do is to be exposed to it in the name of science. We have managed to find 60 volunteers all of whom have now completed the study along with 60 healthy controls.</p> <p>The data have all been collected, and we are hoping to have things analysed and written up by the end of the year.</p>
20	<p>One other aspect of our research is a review paper looking at how people with ES can be treated. Although we've found that EMF probably isn't the underlying cause of their ill health, that still leaves open the question of how to treat them. There has been remarkably little research done on that question, and what little has been done is quite poor quality. Nonetheless, what that literature shows is that reducing EMF exposures for people with ES has no more than a placebo effect. That is not to diminish placebo effects – but there are problems with recommending that course of action to a sufferer when you know it has no specific effect. One thing that does seem to work, however, is a talking therapy called cognitive behavioural therapy. This is designed to help sufferers explore possible other factors that might be contributing to their symptoms. More research is needed.</p>
21	<p>Looking to the future, our funders are of the opinion that no more research is needed for mobile phone sensitivity. That is a remarkable statement - it is not often you find a group of scientists willing to say that no more research is needed.</p> <p>We will see what comes out of the TETRA results. But even if they are resoundingly negative, that may not be the end of the electrosensitivity story in the UK. Public concern about EMF remains high. The smallest thing can trigger a new wave of concern.</p>
22	<p>For example, when the TV programme Panorama reported that Wifi in classrooms could be 3 times higher than the beam of main exposure from a mast (never mind that that exposure is itself many many times lower than permitted levels), the media reaction was predictable. Stories began to appear about people who are sensitive to Wifi, and who experience adverse symptoms whenever they are near to a router. So electrosensitivity may be with us for some time to come.</p>

**end**