# **Health Matters**



Image source: Bluestone 360°

## Health effects and guidance

"Wireless communication is now being implemented in our daily life in a very fast way. At the same time, it is becoming more and more obvious that the exposure to electromagnetic fields not only may induce acute thermal effects to living organisms, but also nonthermal effects, the latter often after longer exposures. This has been demonstrated in a very large number of studies and includes cellular DNA-damage, disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier, impact on vessel and immune functions, and loss of fertility," Johansson (2011). – Refer also to Appendix 8.

It is essential that the possible health effects of electromagnetic fields from Smart Meters, and related technologies, are properly addressed so that appropriate technology is used in rollouts.

The International Agency for Research on Cancer (IARC) has recently reclassified RF/microwave radiation as being possibly carcinogenic to humans (WHO/IARC 2011).

As a result of concerns, some insurers (*including Lloyds of London*) are now withholding coverage for risks linked with such radiation (Ryle 1999).

The Parliamentary Assembly of the Council of Europe now calls for all reasonable measures to be taken to reduce exposure to electromagnetic fields (PACE 2011).

Whilst not all RF/microwave regimes are potentially harmful (*as an example: <u>very low</u> levels of frequency-specific amplitude-modulated EMFs are indicated as beneficial for treating advanced carcinoma (Costa et al. 2011*)); many manufacturers of RF/microwave emitting devices now ensure that their devices carry warnings.

As an example, one mobile phone manual states that studies "have suggested that low levels of RF could accelerate the development of cancer in laboratory animals. In one study, mice genetically altered to be predisposed to developing one type of cancer developed more than twice as many cancers when they were exposed to RF energy compared to controls," (Motorola 2011).

"I want to be very clear. Industry has not said once - once - that ... [RF/microwave radiation is] safe. The federal government and various interagency working groups have said it is safe." K. Dane Snowden, Vice President, External & State Affairs, CTIA-The Wireless Association®\* (Safeschool 2010).

The possible effects that RF/microwave exposures from Smart Meters and related technologies may have on health should be taken very seriously.

Adverse health effects are already being claimed after <u>some</u> Smart Meter rollouts (EMFSN 2011, KCRA 2011). Among conditions that may be exacerbated are: Autism, Alzheimer's disease, Cancer, Diabetes, DNA damage, Electrohypersensitivity, Fatigue/sleep deprivation, Fertility and Obesity.

The following are excerpts from a letter sent to the CPUC judge overseeing 'Smart' Meter proceedings in California:

"Approximately four hours after [the Smart Meter] ... installation ... I developed a band-like headache ... unresponsive to medication. The next morning I awoke with the headache and slight nausea. ... after I was away from my apartment, I noticed that these symptoms resolved — only to return when I was back in my apartment ... I began to have trouble sleeping and difficulty concentrating. I also experienced some transient heart palpitations.

Prior to this I knew nothing about smart meters and had no idea that they could impact human health. ...

I have spent the past 22 days living out of my car, finding shelter at various friends' homes in the evening. ... I am exhausted, frightened, and do not know where to turn," Gregory (2011).

### **UK perspective**

In 2011 the UK's Department of Energy and Climate Change (DECC) confirmed it is involved in discussions with the Department of Health (DH) over potential safety concerns related to the proposed mass installation of Smart Meters in the UK.

The DECC states it aims to continue discussions with the DH as concerns escalate over research linking exposure from Smart Meter technologies with adverse health effects, including increased cancer risk, and that it "*will keep under review any evidence related to the effects of radiofrequency signals on the health of individuals,*" (Evans 2011). UK industry is also addressing these concerns:

"The [UK] Smart Metering System shall be installed and maintained in a manner that protects public safety." Prospectus requirement - The UK Smart Metering Design Group (SMDG 2011).

#### References

Costa, F.P. et al. (2011), Treatment of advanced hepatocellular carcinoma with very low levels of amplitude-modulated electromagnetic fields, British Journal of Cancer (2011), 1-9.

EMFSN (2011), Smart Meter Health Complaints, EMF Safety Network, http://emfsafetynetwork.org/?page\_id=2292

Evans, N. (2011), DECC confirms talks with Dept of Health over smart meter risks. http://www.clickgreen.org.uk/news/national-news/121825-decc-confirms-talks-with-dept-of-health-over-smart-meter-risks.html

Gregory, S. (2011), Letter to CPUC judge overseeing 'Smart' Meter proceedings, http://emfsafetynetwork.org/?page\_id=2292

Johansson (2011). Open letter on the California Council on Science and Technology's report "Health Impacts of Radio Frequency from Smart Meters", http://bemri.org/publications/doc\_download/343-the-california-council-on-science-and-technology-response.html

KCRA (2011), Some SmartMeter Customers Say Devices Make Them Sick, http://www.kcra.com/station/25639450/detail.html

Motorola (2011), Motorola Digital Wireless Telephone User's Guide, 184 pp, http://www.motorola.com/mdirect/manuals/120e.pdf

PACE (2011), The potential dangers of electromagnetic fields and their effect on the environment, Parliamentary Assembly Assemblée parlementaire, Resolution 1815, Council of Europe / Conseil de L'Europe.

Ryle, S. (1999), Insurers balk at risks of phones, The Guardian, 11 April 1999, http://www.guardian.co.uk/uk/1999/apr/11/sarahryle.theobserver

Safeschool (2010), Dane Snowden of the CTIA does not say cell phones are safe. http://www.youtube.com/safeschool#p/u/5/s5yGTZq06zQ

UK SMDG (2011). Industry's Draft Technical Specifications (8th August 2011). UK Smart Metering Design Group (SMDG), 297pp.

http://www.decc.gov.uk/assets/decc/11/tackling-climate-change/smartmeters/2393-smart-metering-industrys-draft-tech.pdf

WHO/IARC (2011), IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans, Press Release No. 208, World Health Organization, 31st May 2011.

# **Health Impacts**

# Possible low cost indicators Dark Field Microcospy



Image source: Havas (2010), http://www.youtube/watch?v=L7E36zGHxRw

Dark field microscopy indicates that some field regimes may cause clumping of red blood cells similar to that found with diabetics, individuals with heart conditions, and cancer patients (Havas 2010).

Rouleaux formation, as shown above (*where blood cells stack together*) is often a precursor to many serious diseases and can occur when blood is exposed to some RF/microwave regimes and intensities.

It may be useful to assess the effects of different Smart Meter regimes on blood parameters using this technique.

## Haemograms/Complete Blood Counts

Another way to assist determining the likelihood of any health impacts from exposures to different Smart Meter formats (and their related technologies) may be to undertake low cost Complete Blood Counts (CBCs) of communities (men, women and children) both before and a few months after Smart Meter installations – as has been suggested for determining the possible effects of other similar (but not identical) exposure regimes from mobile phone base stations (NUO 2011, LLRC 2007, Mashevich 2003).

"In people who live close to relay antennas the CBC reveals noticeable changes, especially a significant drop in red corpuscles and/or white cells (leucocytes, cf leukemia, 'white blood', cancer of the white cells), an increase in lymphocytes, irregularities in the MCV and levels of hemoglobin below normal, an indicator of anemia and other problems." – Next-up Organisation (NUO 2011).

It appears likely that the results of such procedures (as documented above), if undertaken for Smart Meters, would provide valid evidence acceptable in court as to their suitability.

References

Havas (2010), Live blood and electrosmog, http://www.youtube/watch?v=L7E36zGHxRw

LLRC (2007), Orange mast scuppered by £200 Citizen Epidemiology survey, http://www.llrc.org/microwave/aber.htm

Mashevich, M. et al. (2003), Exposure of Human Peripheral Blood Lymphocytes to Electromagnetic Fields Associated With Cellular Phones Leads to Chromosomal Instability. Bioelectromagnetics. 24, pp. 82-90.

NUO (2011), EMFs and changes in the Complete Blood Count, Next-up Organisation, http://www.nextup.org/pdf/EMFs and changes in the Complete Blood Count.pdf

Employing Smart Meter technologies that are proven to be 'biologically friendly' would greatly help allay public fears and further increase their likelihood of their success.

# Health symptoms, RF/microwave radiation and dose response



The possibility of whether a relationship exists between RF/microwave radiation exposures and health symptoms was investigated by Eger & Jahn (2010) in relation to residential proximity to mobile phone base stations.

In that work, 251 adults in Selbitz, Bavaria took part in a health survey in 2009 before the data collected was assessed (taking into account the levels of RF/microwave radiation they were exposed to from the base station and DECT phones), as determined by measurements at residential location and questionnaire. The residents were then classified into exposure groups.

A significant (p < 0.01) dose-response relationship was observed with the four exposure groups for: cardiovascular problems, cerebral symptoms, depression, disorders of the auditory and visual systems and gastrointestinal tract, infections, joint problems, skin problems, sleep problems as related to observed exposure levels and proximity to base station.

Eger & Jahn's results demonstrate that a significant relationship can exist between individuals' mean exposure levels and reported health symptoms. Clear trends were shown for decreasing symptom scores in relation to decreasing mean RF/microwave exposure levels.

Within the framework of the Deutschen Mobilfunkforschungsprogramms (*German Mobile Phone Programme*), the QUEBEB study (Berg et al. 2007) also investigated if health symptoms could be associated with RF/microwave exposure levels. As noted by

Eger & Jahn (2010), it appears that that particular study did not find any significant relationships between exposure and health symptoms because the highest measurement found was 1 V/m, with 99% of the measurements being below 0.34 V/m.

Whilst less than 1% of those in the QUEBEB study were exposed to RF/microwave radiation above 0.34 V/m, 82 out of the 251 participants in Eger & Jahn's study (32.7% of the group) were exposed to fields above 0.7 V/m.

"High exposure groups as found in Selbitz did basically not occur in the samples of the German Mobile Phone Programme. To a certain degree, this has to do with the method of random sampling and leads to a systematic underestimation of the risk for population groups with higher exposures," Eger & Jahn (2010A).

It is proposed that the protocol developed for Eger & Jahn's study might be suitably adapted to assess the possible human health impact of different types of Smart Meter rollouts in comparison with controls.

Many of the symptoms noted as exhibiting a dose-response relationship to RF/microwave exposure are noted in those who have submitted health complaints after <u>some</u> wireless Smart Meter installations.\*

#### References

Berg, G. et al. (2007), Querschnittsstudie zur Erfassung und Bewertung moglicher gesundheitlicher Beeintrachtigung durch die Felder von Mobilfunkbasisstationen (Quebeb) im Auftrag des BMU, Projekt Abschlussbericht, http://www.emf-

forschungsprogramm.de/forschung/epidemiologie/epidemiologie\_abges/epi\_020\_epi\_035\_AB.pdf

Eger, H. & Jahn, M. (2010), Spezifische Symptome und Mobilfunkstrahlung in Selbitz (Bayern) - Evidenz für eine Dosiswirkungsbeziehung, Umwelt - Medizin - Gesellschaft, 23 (2), pp. 130–139.

Eger, H. & Jahn, M. (2010A), Specific Health Symptoms and Cell Phone Radiation in Selbitz (Bavaria, Germany) - Evidence of a Dose-Response Relationship, http://www.next-

up.org/pdf/Horst\_Eger\_Manfred\_Jahn\_Scientific\_Health\_Symptoms\_and\_Cell\_ Phone\_Radiation\_in\_Selbitz\_Germany\_2010.pdf - *English translation of Eger & Jahn (2010).* 



Image source: http://stopsmartmeters.org/2011/08/11/smart-meters-not-green-not-safe-not-legal/

Moldan (2009) noted pulsed microwaves emitted by a single Smart Meter resulted in a power-density of 0.05  $\mu$ W/cm<sup>2</sup> at 1 m (3.28 ft). This increased to 0.2  $\mu$ W/cm<sup>2</sup> 0.5 m (1.64 ft) from the unit and 5.5  $\mu$ W/cm<sup>2</sup> at 30 cm (0.98 ft). Pulsed RF/microwaves can be more biologically active than non-pulsed radiation (Belyaev 2005).

CCST (2011) recorded a power-density of 8.8  $\mu$ W/cm<sup>2</sup> (in the 902-928 MHz range) 30.5 cm (1 ft) from a single wireless Smart Meter for electricity. At a similar distance, they recorded a power-density of 0.00166  $\mu$ W/cm<sup>2</sup> for a single gas Smart Meter operating in the 450-470 MHz range. Units can also operate in the 2.4 GHz range. In that work, power densities of 1.0  $\mu$ W/cm<sup>2</sup> and 0.1  $\mu$ W/cm<sup>2</sup> were measured at distances of 91.4 cm (3 ft) and 304.8 cm (10 ft) from the signal (CCST 2011).

Higher power densities will occur nearer individual wireless Smart Meters and when multiple units (as shown above) and other RF/microwave emitting items are in use. Reflections can also occur, causing potential hotspots and increasing local radiation levels (SA 2011). These will increase the exposure of those spending prolonged periods nearby.

In the assessment of RF/microwave radiation emissions from Smart Meters undertaken by Sage Associates (Sage Associates 2011), it is mentioned, [citing Khurana et al. (2010) and Kundi & Hutter (2009)] that chronic exposure of above 0.05-0.1  $\mu$ W/cm<sup>2</sup> is associated with cardiac problems, increased cancer risk and adverse neurological symptoms.

The exposures that individuals would receive would be determined in part by building construction and distance they were away from the unit(s) and any other pieces of smart technology that are relaying information 24/7. Exposures from other RF/microwave emitting equipment would also contribute to the apparent risk cited.

# Studies matrix of power densities similar to those caused by <u>single</u> wireless Smart Meter

Power	Reported Biological Effects	References
Density		
0.000000001	Altered EEG in humans' brain waves	Bise (1978)
µW/cm²	& behaviour	
0.002	Abnormal blood pressure, digestive	Altpeter et
µW/cm <sup>2</sup>	problems, fatigue, joint & limb pain,	al., (1995,
	nervousness, sleep disorders &	1997)
	weakness	
0.06 µW/cm <sup>2</sup>	Altered adrenal hormone levels &	Dumanskij &
	enlarged adrenals, disturbed	Shandala,
	carbohydrate metabolism, altered	(1974)
	EEG, structural changes in brain,	
	liver, spleen & testes of animals	
0.1 µW/cm <sup>2</sup>	EEG brain waves altered under	von Klitzing
	exposure to cell phone signal	(1995)
0.6 µW/cm <sup>2</sup>	Cardiac arrhythmias & sometimes	Frey (1986)
	cardiac arrest (frogs)	
1.0 µW/cm <sup>2</sup>	Headache, dizziness, irritability,	Simonenko
	fatigue, weakness, insomnia, chest	et al., (1998)
	pain, difficulty breathing, indigestion	
	(humans – occupational exposure)	
0.168 - 1.053	Decrease in newborns & irreversible	Magras &
µW/cm <sup>2</sup>	infertility in mice after 5 generations	Zenos
		(1997)
5.0 µW/cm <sup>2</sup>	Biochemical and histological	Belokrinitskiy,
	changes in brain, heart, kidney &	V.S. (1982)
	liver tissue	
8 µW/cm <sup>2</sup>	Association between increased	Hocking et
	incidences of childhood leukaemia &	al., (1996)
	mortality through RF fields	

"... the possibility of harm from exposures [to low levels of radio frequency radiation] insufficient to cause important heating of tissues cannot yet be ruled out with confidence." Sir William Stewart

Reducing RF/microwave exposure, particularly at night when the body is sleeping, might greatly reduce risk of serious illness.

### References

Altpeter et al. (1995), Study on health effects of the shortwave transmitter station of Schwarzenburg, Berne, Switzerland. BEW Publication Series No. 55. Altpeter, E.S. et al. (1997), Do radiofrequency electromagnetic fields cause sleep disorders? In: Proceedings of the IAE meeting, Munster, Germany. Belyaev, I. (2005), Non-thermal biological effects of microwaves, Microwave

Review. 11, pp. 13–29.

Belokrinitskiy, V.S. (1982), 'Hygienic evaluation of biological effects of nonionizing microwaves', Gigiyena I Sanitariya 6:32-34, JPRS 81865, pp. 1-5. Bise, W. (1978), Low power radio-frequency and microwave effects on human electroencephalogram and behavior. *Physiological Chemistry and Physics*, 10(5), pp. 387-398.

CCST (2011). Health Impacts of Radio Frequency from Smart Meters. California Council on Science and Technology, 50 pp. http://www.ccst.us/publications/2011/2011smartA.pdf

Dumanskij, J.D. & Shandala, M.G. (1974), The biologic action and hygienic significance of electromagnetic fields of super-high and ultrahigh frequencies in densely populated areas. Biologic Effects and Health Hazards of Microwave Radiation, Proceedings of an International Symposium, Warsaw, Oct. 1973.

Frey, A.H. (1986), Evolution and results of biological research with low-intensity nonionizing radiation. Modern Bioelectricity, A.A. Marino (Ed.), pp. 785-837. New York, NY. Dekker.

Hocking, B. et al. (1996), Cancer incidence and mortality and proximity to TV towers. Medical Journal of Australia, 165(11-12), pp. 601-605, Published erratum appears in The Medical Journal of Australia, 166(2), pp. 80.

Huber, R. et al. (2002), Electromagnetic fields, such as those from mobile phones, alter regional cerebral blood flow and sleep and waking EEG," Journal of Sleep Research, 11, pp. 289- 295.

Khurana, V.G. et al. (2010), Epidemiological Evidence for a Health Risk from Mobile Phone Base Stations. International Journal of Environmental Occupational Health, 16, pp. 263-267.

von Klitzing, L. (1995), Low-Frequency pulsed electromagnetic fields influence EEG of man. Physica Medica, 11(2), pp. 77-80.

Kundi, M. & Hutter, H.P. (2009), Mobile phone base stations - Effects on wellbeing and health. Pathophysiology, 16, pp. 123-135.

Magras, I.N. & Zenos, T.D. (1997), RF radiation-induced changes in the prenatal development of mice, Bioelectromagnetics, 18(6), pp. 455-461.

Moldan, D. (2009), Ablesegeräte: Neue Dimension von Funkbelastungen, http://www.diagnose-funk.ch/technik/haushalt-funksysteme/ablesegeraeteneue-dimension-von-funkbelastungen.php#6480269bdb076e70f

Sage Associates (2011), Assessment of Radiofrequency Microwave Radiation Emissions from Smart Meters, Sage Associates, http://sagereports.com/smart-meter-rf/

Simonenko, V.B, et al. (1998), Influence of electromagnetic radiation in the radio-frequency range on the health condition of an organized collective. Voenno-meditsinskiy zhurnal CCCXIX(5), pp. 64-68.