

COMAR Technical Information Statement

IEEE Eng. Med. Biol. Sept/Oct 173-175, 2002.

Electromagnetic Hypersensitivity

Certain individuals experience a variety of health symptoms, which they attribute to exposure to electric or magnetic fields from sources such as power lines, household appliances, visual display units (VDUs), light sources, mobile telephones and mobile phone base stations. Some individuals are so severely afflicted that they cease work and change their entire lifestyle, or take exceptional measures such as sleeping under aluminium blankets.

This perceived sensitivity to electromagnetic fields has the general name "electromagnetic hypersensitivity" or EHS. The fields that electromagnetically hypersensitive individuals consider to be the cause of their symptoms vary considerably, but they are invariably far below recommended exposure limits, and very far below field levels that are known to produce adverse effects in unaffected humans.

This Technical Information Statement describes what is known about EHS and summarizes recommendations from medical groups for helping people with EHS.

Prevalence of Symptoms Associated with EHS

The most comprehensive survey of EHS was reported by Bergqvist and colleagues in 1997. This study identified a list of symptoms reported by electromagnetically hypersensitive individuals. In decreasing order of frequency the symptoms are:

- Nervous system symptoms (e.g. fatigue, stress, sleep disturbances)
- Skin symptoms (e.g. facial prickling, burning sensations, rashes)
- Various body symptoms (e.g. pain and ache in muscles)
- Eye symptoms (e.g. burning sensations).
- Various less common symptoms, including ear, nose, and throat symptoms, digestive disorders.

The severity of the symptoms varied greatly. In some cases they were sufficiently severe to prevent the EHS individual from carrying out normal life activities.

The Bergqvist committee obtained a range of estimates of the number of electromagnetically hypersensitive individuals in the general population. Its survey of Swedish centers for occupational medicine suggested that a few individuals per million in the population are electromagnetically hypersensitive. By contrast, the committee's survey of self-help groups for electromagnetically hypersensitive individuals led to a much higher estimate, of up to a few tenths of a percent the population that experiences some form of EHS. The first estimate may be too low, since it would include only individuals who are treated in occupational health clinics. The second estimate is almost certainly too high, since it was based on individuals who were self-selected for EHS.

Both the prevalence of EHS, and the reported symptoms, vary considerably with geographic location. EHS has a higher prevalence in Sweden, Germany, and Denmark than in the United Kingdom, Austria, and France. EHS individuals in Nordic countries are more likely to report symptoms from use of visual display units, and their symptoms are more commonly related to skin disorders, than elsewhere in Europe (Bergqvist,1997).

Provocation Studies

In provocation studies, investigators expose electromagnetically hypersensitive individuals to electric or magnetic fields similar to those that they considered to be the cause of their symptoms, in an attempt to elicit the EHS symptoms under controlled laboratory conditions. Such studies are valuable in probing for links between the symptoms and exposure to fields.

So far, at least 9 provocation studies have been reported on electromagnetically hypersensitive individuals (for a review of work through the mid-1990s see Bergqvist 1997). The studies have been overwhelmingly unsuccessful in being able to link EHS symptoms in these subjects to exposures to electric or magnetic fields.

For example, Flodin et al (2000) exposed 15 electromagnetically hypersensitive individuals and normal controls to electric and magnetic fields in their homes or workplaces. The electromagnetically hypersensitive individuals were no better than control subjects in identifying their exposure to electric or magnetic fields during the experiment.

Some users of mobile telephones have reported headaches and other health symptoms connected with the use of the phones (Chia et al 2000). Hietanen and colleagues (2002) tested 20 subjects who considered themselves to be sensitive to fields from mobile telephones. During real or sham (simulated) exposures to radiofrequency (RF) energy from mobile telephone handsets, the subjects reported a variety of symptoms. However,

the authors report, "the number of reported symptoms was higher during sham exposure than during real exposure conditions," and "none of the test subjects could distinguish real RF exposure from sham exposure".

One early study, by Rea and colleagues (1991) did elicit responses from electromagnetically hypersensitive individuals by exposing them to magnetic fields at levels comparable to those found in many ordinary environments. In that study, electromagnetically hypersensitive individuals were exposed to magnetic fields over a range of frequencies (from 0.1 Hz to 5 MHz), from a coil positioned 0.3 meters from their feet. However, other investigators criticised that study because of the possibility that the coils produced audible cues, and other technical problems (Bergqvist 1993). It is well known that such cues can easily confound studies that seek to establish the sensitivity of individuals to weak electric and magnetic fields (eg. Tucker et al (1978)).

Taken as a whole, the provocation studies strongly suggest that EHS symptoms are not related to actual exposures to electric or magnetic fields, and that electromagnetically hypersensitive individuals are no better than non-hypersensitive individuals in detecting the presence of fields.

Resemblance to Other Disorders

The symptoms reported by electromagnetically hypersensitive individuals, such as headache, fatigue, and stress, are common and nonspecific, i.e. they may have many causes.

In some cases, the symptoms experienced by electromagnetically hypersensitive individuals may result from environmental factors other than electromagnetic fields. These might include "flicker" of fluorescent lights, glare and other visual problems with VDUs, and effects resulting from poor ergonomic design of workstations. Other factors might include poor indoor air quality or emotional stress in the workplace or living environment. Sensations of warmth when using a mobile telephone might be caused by heat generated in the electrical circuits within the handsets, or from lack of air circulation around the ear when the handset is held against it.

There is also clear evidence that psychological factors are important in some cases. For example, some of the subjects in the study by Tucker (1978) reported headaches during placebo experiments in which the fields had never been turned on.

EHS bears close resemblance to idiopathic environmental intolerances (IEI), otherwise known as multiple chemical sensitivities (MCS). In MCS, individuals report a variety of symptoms which they attribute to exposure to chemicals in the environment (Bornschein et al, 2001). In both EHS and MCS the symptoms are nonspecific (might have a variety of causes), the exposure levels to chemicals or electromagnetic fields are invariably far below those that are expected to produce adverse effects, and provocation studies are

typically unable to link the symptoms with exposure. Both syndromes remain poorly understood.

Finally, EHS has apparent similarities to "microwave illness", which has been reported in the Russian and Eastern European medical literature at various times since at least the 1970s. This syndrome is characterized by nonspecific symptoms such as headache and malaise in workers with presumed exposure to electromagnetic fields. However, the syndrome is not recognized by Western physicians. Moreover, the Russian data consist largely of case reports (and not well-controlled epidemiology studies, which would be more informative) with little if any attempt to determine the fields to which the workers were actually exposed. Consequently, the nature of the electromagnetic field exposure that produced the symptoms is not established (Gluszczyk 1979). Other physicians have complained about the vagueness of the diagnostic criteria for the illness (eg. Djordjevic 1983).

Helping electromagnetically hypersensitive individuals

Whatever its cause, EHS is a real, and sometimes disabling, problem for the affected individual. The Bergqvist committee offered recommendations for helping electromagnetically hypersensitive individuals, which are summarized below.

The Bergqvist committee recommended that the starting point for all treatment should be the health symptoms of the individual, and not his or her perceived need for electrical "sanitation" of the workplace or home. Electromagnetic field surveys in normal workplace and residential environments are extremely unlikely to uncover the presence of fields that can be related to the symptoms of the EHS individual.

In helping electromagnetically hypersensitive individuals, it is important to try to identify and treat any relevant health, environmental, or occupational hygiene problems that might be present, without assuming that they are caused by exposure to electric or magnetic fields.

This requires, for severely affected individuals:

- Medical evaluation of the EHS individual to identify and treat any specific medical conditions that may be responsible for the symptoms.
- Evaluation of the workplace or home for factors that might contribute to the presented symptoms. These might include indoor air pollution, excessive noise, poor lighting, or ergonomic factors. In the workplace this evaluation would normally be conducted by an industrial hygienist.

Apart from identifying any treatable causes of the patient's symptoms, physicians need to initiate communication with the EHS individual and help develop strategies for coping with the situation.

For electromagnetically hypersensitive individuals with long lasting symptoms and severe handicaps, therapy should be directed principally at reducing symptoms and functional handicaps. As recommended by the Bergqvist committee, this should be done in close co-operation between

- Physicians (for handling the medical aspects of the symptoms)
- A hygienist (for identifying and if necessary controlling factors in the environment that are known to have adverse health effects of relevance to the patient) and
- A psychotherapist, where appropriate.

The Bergqvist committee also stressed the importance of providing electromagnetically hypersensitive individuals, health-care professionals, and employers with information about health and safety hazards of electromagnetic fields, and their possible relation to EHS. The committee stressed that this information should be balanced and appropriate for different target groups, including the general population and various professional groups. The committee also stressed that the information should include a clear statement that no scientific basis currently exists for a connection between EHS and exposure to electromagnetic fields.

Given the similarity of EHS to multiple chemical sensitivities, medical advice for handling MCS patients might also be helpful. For example, Magill and Suruda (1998) recommend that treatment should aim to establish an effective physician-patient relationship, and encourage patients to return to work and to a normal social life.

Sources and Further Reading:

U. Bergqvist, O. Franzen; W. J. Rea, E. J. Fenyves, Electromagnetic Field Sensitivity (Letter And Reply), *Electro Magnetobiol* 12(1):v-vii, 1993.

U. Bergqvist and E. Vogel, EDS. Possible health implications of subjective symptoms and electromagnetic fields. A report prepared by a European group of experts for the European Commission, DGV. *Arbete och Hälsa*, 1997:19. Swedish National Institute for Working Life, Stockholm, Sweden. ISBN 91-7045-438-8. (In Swedish). An extended summary of the report is available in English at <http://www2.niwl.se/forlag/en/>

U. Bergqvist, L. Hillert, and E. Birke, Electromagnetic hypersensitivity and health risks from

electric and magnetic fields. Research review and evaluation. Final report from the task

group at the Swedish Council for Work Life Research. Kinköping, Sweden: Swedish Council

for Work Life Research; November 2000. (In Swedish)

S. Bornschein, H. Forstl, T. Zilker, Idiopathic environmental intolerances (formerly multiple chemical sensitivity) psychiatric perspectives, *J. Int. Med.* 250: 309-321 OCT 2001.

S. E. Chia, H. P. Chia, and J. S. Tan, Prevalence of headache among handheld cellular telephone users in Singapore: a community study. *Environ. Health Persp.* 108:1059-1062, 2000.

Cost 244bis, Proceedings from Cost 244bis International Workshop on Electromagnetic Fields and Non-Specific Health Symptoms. Sept 19-20, 1998, Graz, Austria.

Z. Djordjevic, A. Kolak, V. Djokovic, P. Ristic, Z. Kelecevic Z, Results of our 15-year study into the biological effects of microwave exposure. *Aviat Space Environ Med* 54:539-42, 1983.

U. Flodin, A. Seneby, and C.Tegenfeldt, Provocation of electric hypersensitivity under everyday conditions. *SCAND. J. Work Environ. & Health*, 26: 93-98, 2000.

M. Gluszc M, Difficulties in the certification of microwave disease. *Med Przemyslowa* 30:147-150, 1979.

M. Hietanen, A-M Hamalainen, T. Husman, Hypersensitivity symptoms associated with exposure to cellular telephones: no causal link, *Bioelectromagnetics* 23:264-270, 2002.

M. K. Magill and A. Suruda, Multiple Chemical Sensitivities, *American Family Physician* Sept. 1, 1998.

W. J. Rea, Y. Pan, E. J. Fenyves, I. Sujisawa, H. Suyama, N. Samadi, G. H. Ross, Electromagnetic Field Sensitivity, *J Bioelectr* 10:241-256, 1991.

R. D. Tucker, O. H. Schmitt, Tests For Human Perception Of 60 Hz Moderate Strength Magnetic Fields, *IEEE Trans Biomed Eng* 25:509-518, 1978.