



Electrosensitivity

Prepared by Belgian BioElectroMagnetics Group (BBEMG)

For some decades, our electromagnetic environment has been deeply modified by the growing use of electricity in our industrialised countries. Next to natural sources, terrestrial or cosmic, come artificial sources due to numerous technical advances that use electricity and its properties.

A growing number of people report a variety of non-specific symptoms, that they attribute to electricity. The symptoms appear at exposure levels that do not lead to any reaction in the majority of people, at frequencies and intensities to which the population is exposed and far below international recommendations.

What is electrosensitivity?

Definition and characteristics

Electrosensitivity covers symptoms attributed by a person who suffers from being in the vicinity or using electric equipment. It results in varied degrees of discomfort or poor health perceived.

In certain cases, people are so severely affected that they isolate themselves and are led to quit working and to change their lifestyle, while others report mild symptoms which bring about an avoidance of certain electromagnetic field sources.

The following terms can also be encountered:

- hypersensitivity to electricity (EHS)
- electromagnetic hypersensitivity
- environmental idiopathic intolerance with attribution to electromagnetic fields (IEI-EMF)

Note: Disorders associated with environmental factors (here, electromagnetic fields) and sharing "*similar non-specific medically unexplained symptoms that adversely affect people.*" (Source: [WHO, 2005](#))

Similarities exist with other environmental pathologies, such as multiple chemical sensitivity (MCS) or the sick building syndrome (SBS) (see the report of the [Danish Environmental Protection Agency, 2005](#)).

People of **all ages** can become electrosensitive. However, studies show that a larger proportion of **middle aged women** are prone to this. Some studies put forward various proportions of electrosensitive individuals depending on educational and/or socio-economic levels, but results are contradictory (Hillert et al., 2002; Institut für Angewandte Sozialwissenschaft, 2003).

1 Symptoms

An homogenous profile of electrosensitivity does not exist, neither according to the kind of symptoms nor how quickly they appear at the time of an exposure or the kind of exposure concerned. Various symptoms are reported, they include:

- **dermatological symptoms:** some electrosensitive individuals report redness of their face when working on a visual display unit, tingling or burning sensations in the vicinity of electric devices.
- **neurasthenic and vegetative symptoms:** the neurovegetative system controls the functioning of internal organs. This involves the regulation of digestion, metabolism, circulation, body temperature, secretions, reproduction, homeostasis, respiration and so on. The neurovegetative system is composed of ortho- and para- sympathetic systems. They have opposite effects on organs: they stimulate or inhibit the functioning of the latter, which lead to a precise regulation of the activities of organs. Some electrosensitive individuals report fatigue, headaches, sleep disorders, anxiety, digestive disturbance (e.g. nausea), concentration and memory difficulties, dizziness ...
- **other symptoms:** some electrosensitive individuals report throat, nose and ear disorders, as for example ticklings in the throat. Other patients also report eye irritations.

A specific symptomatic profile does not exist, which means that symptoms can have similarities to other disorders or diseases. These symptoms are also frequently encountered in the general population.

Some authors analysed symptoms described by electrosensitive individuals. According to symptoms, some authors speak about two kind of electrosensitivity, a first one related to more subtle troubles linked to a specific electrical apparatus (for example, a mobile phone) and another one characterized by multiple and complex symptoms, associated with several electrical stimuli (Rubin, Cleare & Wessely, 2008).

1.1 Examples of the main results

Hillert et al. (2002)

Classification in decreasing order of the most mentioned symptoms by 167 interviewed electrosensitive individuals:

- Tiredness
- Facial skin problems
- Sense of heaviness in head
- Eye irritation
- Runny and stuffy nose
- Headache
- Difficulties to concentrate

The authors didn't observe any differences between symptoms mentioned by women and men.

Röösli et al. (2004)

Classification in decreasing order of the most mentioned symptoms by 394 interviewed electrosensitive individuals:

- Sleep disorder
- Headache
- Nervousness/distress
- Tiredness
- Concentration difficulties
- Tinnitus
- Dizziness
- Limb pain
- ...

The authors didn't observe any differences between symptoms mentioned by women and men.

Schüz et al. (2006)

Classification in decreasing order of the most mentioned symptoms by 192 electrosensitive individuals who have completed an online questionnaire or sent an email:

- | | |
|--------------------------------|----------------------------------|
| • Tiredness | • Changes in mood |
| • Concentration difficulty | • Pain in limbs |
| • Sleep disturbance | • Increased sensitivity to noise |
| • Weariness | • Equilibrium disturbance |
| • Crankiness | • Increased sweating |
| • Obliviousness | • Twitches of the eyelid |
| • Headache | • Impaired vision |
| • Gone feeling | • Conditions of fear |
| • Vertigo | • Anxiety |
| • Increased heart beat | • Itchiness |
| • Depressed mood | • Feeling of warmth in the head |
| • Feeling pressure in the head | • ... |
| • Exhaustion | |

44% of respondents presented symptoms that they associated with EMF, but they didn't consider themselves as electrosensitive.

In their pilot-study in the Netherlands, **Schooneveld & Kuiper (2008)** analysed health problems described by 250 electrosensitive individuals. Data were obtained by questionnaire. They reported both subjective and objective symptoms. Most-cited neurological complaints include chronic fatigue (70%), headache, concentration and sleep problems ... Among the most-cited somatic complaints (87%), the authors found facial skin problems, impaired vision, feeling of pressure in the head ... Skin complaints were reported

by half of the respondents, of which 66% of facial skin problems.

In **Schröttner & Leitgeb (2008)**, the symptoms most frequently described by electrosensitives (3.5% of respondents having answered “Yes” to the following question: “Do you feel disturbed from electromagnetic pollution?”) were sleep disturbances, migraine, nervousness and tinnitus.

Huss & Rööslı (2006) conducted 342 completed telephone interviews of general practitioners (GPs). They reported the following symptoms (% of patients complaining about the symptom in connection with electromagnetic fields): sleep disorders (43% of cases), headaches (39%), fatigue (14%), nervousness (12%), vertigo (10%), concentration difficulties (8%), tinnitus (4%), anxiety (3%), tumours (2%) and cardiac arrhythmias (2%).

GPs judged the association between EMF and the symptoms to be plausible in 54% of the cases.

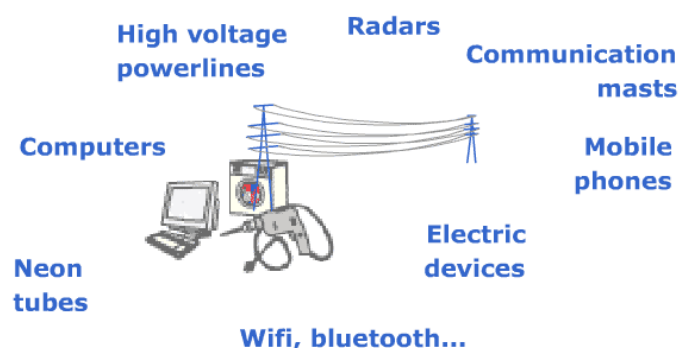
1.2 Symptom characteristics

- They quickly appear : from some minutes in 57% of cases to several hours in 21% of cases (see Rööslı et al, 2004)
- They are transitory and disappear with a distance from the source. Sometimes, delayed or extended reactions are noticed after exposure.

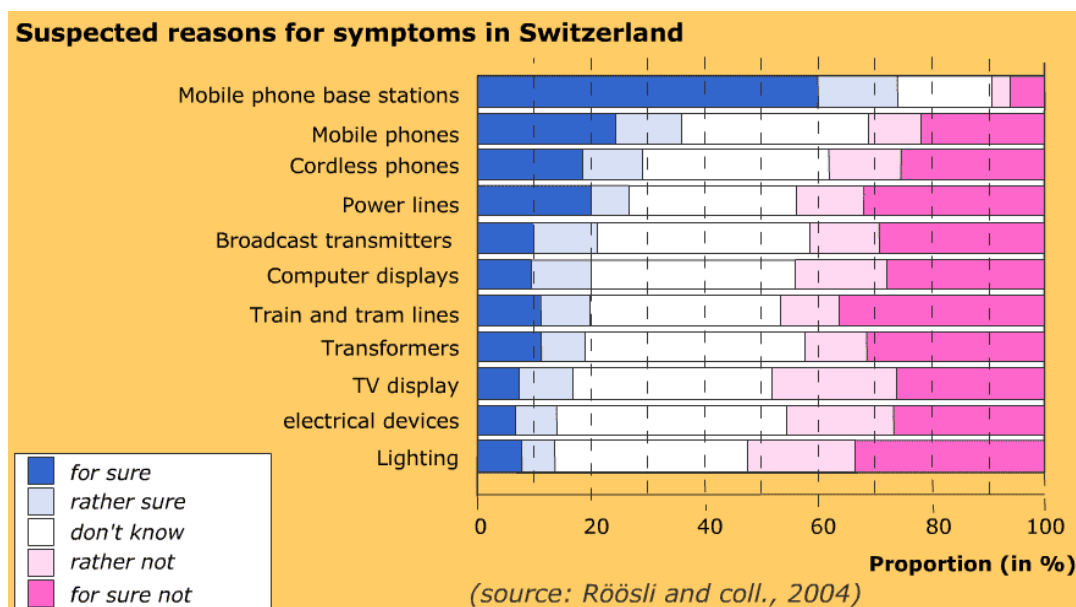
Symptoms appear for exposure levels that do not lead to reaction from the majority of other people, frequency and intensity levels at which people are exposed and largely under international recommendations.

2 Sources

Incriminate sources are always more widespread in our modern society.



Röösli et al. (2004) analysed the suspected reasons of the symptoms. Results of this study are listed below:



A real specificity of symptoms according to the source does not exist. Schreier et al. (2006) noticed that concerns are more often expressed with regard to mobile phone masts or high voltage powerlines compared to mobile phones, electric devices and wireless phones. Similar results were obtained in another study (Siegrist et al., 2005) and in Austria (Hutter et al., 2004).

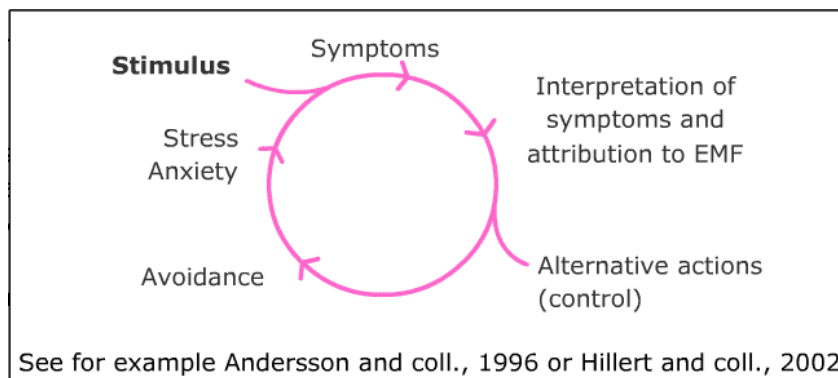
3 Consequences

In some people, a progression from electrosensitivity to chronicity is observed. Consequences are varied:

- physical and psychological suffering (worry, anxiety, depressive states, stress...), alteration of the overall health status;
- behaviours of avoidance to exposure
- the organisation of a patient's life around this concern
- absenteeism, working incapacity
- social isolation
- enhancement of primary care use;
- financial problems due to moving and changing the electrical wiring of a house ...

Sometimes, a misunderstanding of professional and familial entourage and the medical world's failure to recognize the condition worsen the isolation of an electrosensitive individual.

Several authors speak of a vicious circle where symptoms, their association with one (some) electromagnetic sources and avoidance behaviors follow one after the other, then amplify and keep themselves up.



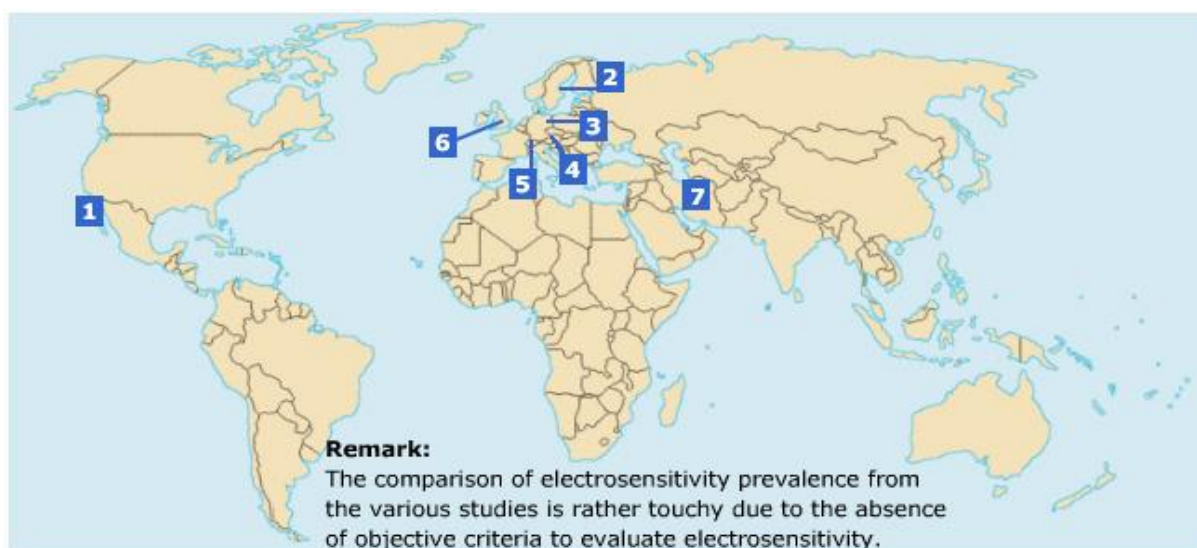
Prevalence of electrosensitivity

1 The European Commission Survey (Bergqvist et al, 1997)

Questionnaires were sent to 138 centres for occupational medicine and 15 self-aid groups (response rate respectively 49 and 67%). It was an exploratory study:

- From several people out of a million (in the UK, Italy and France, with respect to centres for occupational medicine) to a few tenths of a percent (in Denmark, Ireland and Sweden, with regard to self-aid groups).
- Symptoms and sources varied depending on the country.

2 National results



1. California (Levallois et al., 2002)

Telephone survey among 2,072 Californians over 18 years (response rate=84%). To the question: "Are you allergic or very sensitive to getting near electric appliances, computers or power lines?", 3.2% of the respondents defined themselves as electrosensitive. 24% of the respondents reported chemical sensitivity (1.3% reported electrosensitivity without any chemical sensitivity).

2. Sweden

Stockholm (Hillert et al., 2002)

Questionnaire survey among 15,000 men and women between 19 and 80 years (response rate=73%).

To the question: "Are you allergic or hypersensitive to electric or magnetic fields?", 1.5% of the respondents defined themselves as electrosensitive.

Scania (Carlsson et al., 2005)

Postal questionnaire survey among 24,922 people between 22 and 84 years (response rate=59%).

To the question: "During the past 14 days, did you experience annoyance that you associate with [chemical or electrical factors]?", 30.2% of the respondents quoted at least one factor, of whom 40% an electrical factor.

3. Germany

(Schroeder, 2002)

Phone survey among 2,406 individuals over 14 years (response rate=61.4%). With the help of predetermined criteria, authors conclude that 6% of the German population is electrosensitive.

(Institut für angewandte Sozial-wissenschaft, infas, 2003)

8 % of the German population is electrosensitive.

4. Austria

(Schröttner & Leitgeb, 2008)

Phone survey among 460 people between 15 and 80 years (response rate=88%). To the question: "Do you feel disturbed from electromagnetic pollution?", 3.5% of the respondents defined themselves as electrosensitive.

(Leitgeb & Schröttner, 2003)

Study on 708 adults, between 17 and 60 years of age (response rate=55.1%).

These authors distinguished:

- "electromagnetic sensibility" (ability to perceive electric and electromagnetic exposure)
- "electromagnetic hypersensitivity" (developing health symptoms due to exposure to environmental electromagnetic fields).

In the population studied, 4.2% of women and 1.7% of men were "electromagnetic sensible". This sensibility is characterized by a current perception threshold.

5. Switzerland (Schreier et al., 2006)

Phone survey among 2,048 individuals over 14 years (response rate=55.1%).

2.7% of all respondents reported adverse health effects attributed to electric and magnetic fields. 2.2% reported having had such effects in the past.

6. England (Eltiti et al., 2007a)

Questionnaire survey among 20,000 people randomly selected (response rate=18.2%).

From the EHS screening tool, authors reported that 4% of the respondents are sensitive to electric and magnetic fields.

The EHS screening tool is composed of 3 criteria:

- a total symptom score greater than or equal to 26,
- the individual explicitly attributes his or her symptoms to exposure to EMF-producing objects and,
- current symptoms cannot be explained by a pre-existing chronic illness.

7. Iran (Mortazavi et collal2007)

Questionnaire survey among 690 students apparently in good health from 2 Iranian universities (response rate=75%).

Authors did not find any associations between reported symptoms and the use of mobile or cordless phones and cathode ray.

Diagnosis

Establishing a diagnosis of electrosensitivity is difficult in the absence of objective specific clinical signs or specific / sensitive pathophysiological markers capable of characterizing this intolerance. No plausible biophysical mechanism is known.

It is important to emphasize that these symptoms are real and that the individual's suffering cannot be questioned. However, they objectively cannot be attributed to electromagnetic fields. Indeed, so far:

- **epidemiological studies** cannot clearly determine the effective cause of reported symptoms (effects linked to field exposure or linked to risk perception and worries generated?)
- **provocation studies** have not allowed us to establish a direct causal link between the appearance of symptoms and the exposure to electric, magnetic or electromagnetic fields, regardless of their frequency: exposure to these fields doesn't always lead to symptoms and inversely the latter also appear in the absence of fields.

Note:

Epidemiological studies analyse the frequency of symptoms in a long term exposed population to certain kinds of fields, due to, for instance, the presence of a high voltage powerline or mobile phone base station in the vicinity of their home.

In provocation studies, volunteers are exposed in laboratory to electric and or magnetic fields. They have to determine if they have been exposed (field detection) and to report potential symptoms. They also can be submitted to various tests of memory or attention.

With regard to the frequency studied, equipment differs: on the right, a helmet used to analyse reactions during exposure to extremely low frequency fields (50Hz).

In order to validate the experiment, neither the volunteer nor the researcher know whether the exposure is real or sham. This is called double-blind studies.

Magnetic helmet developed in the framework of the research contract of BBEMG by [ACE](#) and [TDEE](#)



According to the expert group of the European Commission (Bergqvist et al, 1997) and the working group of WHO (see factsheet n°296), the word "electrosensitivity" doesn't imply an established relationship between electromagnetic fields and health symptoms because provocation studies have not shown a clear relation between subjective feelings and exposure to electromagnetic fields.

However, provocation studies testing immediate and acute effects of exposure have their limits. For example, these studies:

- do not take into account the latency in symptom appearance because of a relatively short exposure period.
- only present a single EMF source or harmonics artificially generated
- lead to additional stress (effect of anticipation)

In summary, provocation studies do not allow to demonstrate the existence of a biophysical mechanism for the electrosensitivity (review in Rubin et al., 2010). Moreover, given that symptoms appear as well in real than in sham exposures indicate that symptoms could be explained by **nocebo** effects. These nocebo effects are linked to an effect of conscious expectation of symptoms following perceived exposure and a heightened vigilance towards possible indicators of exposure (Rösli, 2008 ; Rubin et al., 2010).

We would like to emphasize that symptoms can be a manifestation of organic pathology. An extensive medical evaluation must allow to exclude all known pathologies.

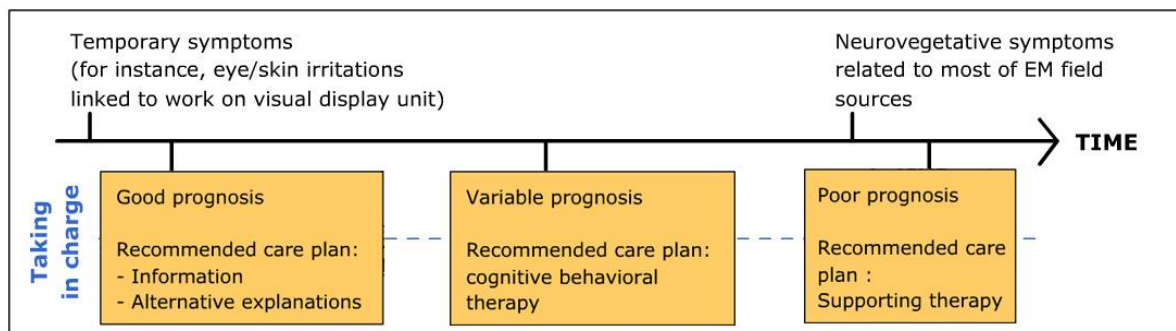
Treatment

In the absence of the demonstration of causal relationships and defined diagnosis criteria, the first step consists of rejecting all known medical pathology that may be responsible for symptoms (Dahmen et al., 2009; Rubin et al., 2010). From the identification of the environmental, psychosocial and medical conditions of electrosensitive individuals, individualized, multidisciplinary and overall taking in charge of patients should be privileged (Rubin et al., 2008; Brand et al., 2009).

The choice of a therapy should be based on clinical presentation, as well as response to treatment. Numerous therapeutic techniques have been the object of publications and among these **cognitive behavioural therapies** prove to be the most effective (Hillert et al., 2002; Irvine, 2005; Rubin et al., 2006).

Cognitive behavioural therapies are based on observable behaviours, thoughts and ensuing emotions. By joint work with the therapist, the patient strives to become aware of his/her thoughts, and the possible gap between them and reality, and thereafter gradually replaces negative or mistaken thoughts by the learning of new behaviours.

Hillert et al. (2002) indicated that prognosis was better when the care plan was precociously carried out and when symptoms were associated with work on visual display units.



A spontaneous remission is noticed in a certain number of cases.

Röösli et coll. (2004) analysed the means that are carried out to avoid symptoms.

Reducing exposure is often considered as a temporarily or partially effective means in the improvement of symptomatology by people who complain about this. Reducing exposure seems to lead an electrosensitive individual to a spiral of avoidance and arrangements that sometimes have important consequences in term of costs, social and professional isolation and quality of life.

Because reported complaints mainly concerned usual exposure level encountered in our everyday life, this solution should be first deeply thought about in light of exposure evaluations and scientific data in this field.

Overall, it is recommended to be wary of gadgets that are supposed to reduce or cancel magnetic fields.

Prospects for research

At this time, researchers agree on a multifactorial origin of electrosensitivity:

- **Organisational and psychosocial factors**, for example work organisation and stress, family problems, life events, social isolation, role of media and communication, cultural context, risk management, risk perception...
- **Physical factors**, for example electric and/or magnetic fields, electrostatic fields, contact currents, neon lights, dusts, weak humidity in the air, high ambient temperature...
- **Internal factors**, for example psychological and cognitive (psychiatric pathology, personality, anxiety, negative affect, past experiences, expectancy effects, absorption...) or biological and physiological (age, feminine sex, allergic status, psychophysiological reactivity...)...
- **chemical factors**, for example exposure or sensitization to toxic substances, heavy metals (example: mercury of dental fillings), moisture, mycotoxins...

We emphasize the fact that some factors, such as chemical factors, are often evoked even though we do not have any scientific plausible data to justify their intervention.

Results from a study (Ghezel-Ahmadi et al., 2010) indicate that heavy metal (Mercury, Lead, Cadmium) load is of no concern in most cases of EHS but might play a role in exceptional cases. Data of this study (132 patients and 101 controls) do not support the general advice to heavy metal detoxification in EHS.

Hypothesis of a hyper reactivity of the central nervous system

Electrosensitive individuals could have a higher reactivity of the central nervous system (Wang et coll., 1994; Sandström, 1997; Lyskov et coll., 2001). It could be a physiological predisposition that could lead to higher sensitivity to environmental stressors.

They also present difficulties to discriminate real and sham stimulations in transcranial magnetic stimulation tests (Landgrebe et al., 2008; Report of the Afsset, 2009).

Research in process in Liege (Belgium)

More research is needed in order to better understand reasons and other aspects of symptomatology, as well as to test the effectiveness of therapeutic methods targeted at better helping individuals who complain of electrosensitivity.

Further information is available at [PNE study](#).

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