

Introduction to Electrical Hypersensitivity

People who have electrical hypersensitivity (EHS) get symptoms from exposures to electromagnetic fields (EMF). These fields surround electrical wires and electrical equipment, such as computers, televisions, electric stoves, telephones, transformers, electric heaters, cell phones, fluorescent lights, inverters, hybrid cars, all types of wireless devices and more.

The illness goes by several different names and acronyms, such as ES, EMF and EHS. EHS is the term used by researchers and the World Health Organization, and it appears to be the most accurate term, though ES (electrical sensitivity) is commonly used in the United States.

Many people with EHS also have multiple chemical sensitivity (MCS) and allergies, often severely so. Some are also bothered by noise, sunlight, narrow spectrum (LED) light, flickering light, and other stimuli.

Symptoms of EHS

The symptoms of EHS vary and may include flushing of the skin, tingling and burning sensations, joint pains and stiffness, headaches, a feeling of being “wired” and sometimes personality changes, such as mental confusion, sleep problems, restlessness and irritability. A variety of other neurological, digestive and cardiac symptoms are also possible.

Tinnitus is a common symptom. A few people are able to “hear” EMF, though it is unclear whether it is a form of tinnitus, the “Frey effect” or something else.

There seems to be an overlap with ADHD and restless leg syndrome, as the symptoms of these syndromes are frequently seen in people with EHS.

The level of sensitivity varies greatly with the person, just as it does with pollen and food allergies. Some people may just have minor symptoms, like flushing or feeling restless when working on a computer, while extremely sensitive people may need a modified vehicle and live in a remote area, away from transmission towers and power lines.

Most people with EHS are sensitive to the magnetic fields from electrical lines that carry a current. Some are also sensitive to the electrical fields, which only depends on the voltage and not whether there is any current.

In one of her books about EHS, Swedish journalist Gunni Nordstrom tells the story of a man who had a titanium plate installed in his jaw. He could not tolerate using a cell phone until the plate was removed again. Perhaps metal implants act like antennas for the radiation, causing problems for the body. In that case, metal fillings in the teeth could be a cause of EHS.

A person who is frequently exposed to EMF tends to become more sensitive over time once the path of illness has started. It is thus a very bad idea to try to tough it out, as that can very well have lasting, maybe permanent, effects. Early intervention may halt further progression of EHS.

It usually takes some time before the symptoms start, typically a few minutes. The symptoms may change with continuing exposure. With longer exposures, the symptoms may go away, as the body tries to adapt, though the damage and possibly increased sensitivity may continue.

Symptoms rarely stop as soon as the exposure stops. It can take minutes, hours or days to recover.

Some people first get symptoms several hours after the exposure. Some are stronger and able to tolerate more exposures at certain times, such as early in the day or after a meal, or simply for no known reason. A person who is also very sensitive to mold may be more tolerant of EMF by moving away from a moldy house, perhaps to a dry climate.

Stronger exposures generally can be better tolerated for a brief moment than for longer times.

The history and status of EHS

Nikola Tesla (1856-1943) invented many electrical devices and pioneered the use of alternating current. He developed sensitivities to sound and light and had various problems with the skin and nervous system, which apparently makes him the first to suffer from EHS.

The first modern cases the author is aware of were a Swedish telecommunications engineer, and an American professor who both became ill in 1979. Dr. William Rea, a prominent environmental doctor in Texas, saw his first case in the early 1980s, though he said there may have been earlier cases he did not recognize.

Research into the illness is sparse, as it is just in the last decade that enough cases have surfaced to be noticed. Most research has been done in Europe, especially

Sweden. A few medical conferences have been held in Europe, only one in the U.S.

The World Health Organization started getting interested when their own Director-General, Gro Harlem Brundtland, announced that she had EHS shortly before she retired. Dr. Brundtland is well known in Europe for many good works. She was also the Prime Minister of Norway for over ten years.

Until EHS has been proven and accepted, EHS patients not only have to struggle with a debilitating illness, but they are also routinely denied reasonable accommodation and are subjected to suspicion and often hostility and ridicule from the medical system and its doctors. This follows the pattern of many emerging illnesses, where the medical system finds it much more convenient to write patients off as mental cases—sometimes aided by special interests, as was done against people with asbestosis (asbestos lungs). It is no more than a couple of decades ago that people with asthma were told by their doctors that they just needed to learn to relax, and when AIDS became an epidemic, it took 10,000 dead in the U.S. before the country's officials took it seriously—mostly prompted by the death of the Hollywood actor Rock Hudson. People with Lyme Disease were also often ignored by doctors, until reliable blood tests became available. People with ulcers were told it was all stress, until the *H. Pylori* bacteria was discovered.

Even today, patients with migraines, fibromyalgia and endometriosis are still met with suspicion from some doctors.

Despite the fact that mainstream medicine does not accept that low levels of electricity affect humans, it is now common to use weak electrical currents to help heal complicated bone fractures. Research on using EMF to treat depression is also advancing rapidly.

Treatment

Very few resources have been put into studying which treatments are effective for EHS patients. Doctors are largely limited to anecdotes, their own experiments, and a few surveys which all conclude that the most effective treatment is avoidance.

Some critics only want to consider what has been proven by science, but this will cost money and time, with very little progress on the horizon. EHS research is still only in its infancy. While the world of medicine should rely on scientific data as much as possible, the patients with EHS cannot wait the decades it will likely take. Patients will have to rely on the best available information to try to make as

decent a life for themselves as they can. Patients with other illnesses, such as CFS/ME, MCS, etc. are in the same situation.

With today's knowledge, the primary treatment focus should be on avoiding every kind of EMF. It may also help to take care of other health problems, especially food and inhalant allergies, as well as MCS, if these exist.

Secondarily, various experimental treatments can be considered, though they are often not covered by health insurance. Some of these treatments, such as heavy metal detoxification, can be harmful if not done very carefully.

Housing

Housing is a challenge for people with EHS. Apartments are often not feasible, due to the close proximity to neighbors and their electronic gadgets. The higher density of people may also mean a higher level of magnetic fields from the electrical wiring.

If they can afford it, people with EHS tend to migrate to single-family homes. People with severe EHS may need to move to a rural area, with greater distances to neighbors and a lower level of electrosmog. A few people have to live in camping trailers and specially built houses.

Daily Life

The daily life of someone with EHS can be as varied as for regular people. The level of sensitivity dictates many parts of the daily routine, however.

Some can cook on an electric stove, perhaps making sure to keep a distance when not tending the pot. Others cook very simple meals to minimize exposures, cook on a remotely controlled hot plate, on an outdoor propane stove, or have someone else do the cooking.

Some people can listen to a battery-powered radio for a few minutes to catch the news, while others can listen to music for hours.

Most people with EHS avoid using cell phones or use them sparingly. A traditional landline telephone is often their only viable means of communication. Some need to use a speaker phone to keep a distance to the telephone, while some use a special "tube phone".

Computers are a common difficulty. Some can only use a computer for five minutes, while others can use it much longer. In some cases, people live with the

symptoms in return for being connected to the rest of the world a few times a week.

Most people with EHS do their own shopping, which means they get exposed to various sorts of radiation in the store from cell phones, cash registers, wireless networks, etc. Getting out of the house is good for the mental health and hiring a shopper is not always feasible. The exposures can be reduced by going when there are fewer customers and by keeping a distance to various radiation sources. It also appears that people with EHS can tolerate more radiation when moving around, compared to when at rest.

Some people with EHS have heightened sensitivities following trips out of their safe homes and may need a day of rest afterwards.

Daily living is often a matter of managing a budget of exposures. When the budget is exceeded, it has consequences. For some, this exposure budget is very small.

Helping people with EHS

Avoidance is central to keeping a patient well. The extent needed depends on the individual. There are, unfortunately, no one-size-fits-all measures available for most situations.

At the least, it is important to keep the sleeping area as safe as possible by removing all electrical equipment from the vicinity. Keep in mind that EMF is not blocked by walls. A patient should not sleep near a refrigerator, electric meter, water heater, cordless phone, clock radio or other appliances or electronics, even with a wall in between. It is best to have wired telephone and internet service in the home, instead of the wireless versions.

EMF cannot be seen, and very few people can sense it directly. Instead, instruments are needed. There is no meter which can measure all types of EMF. Several are needed for good coverage.

A gaussmeter measures low frequency magnetic fields from electrical wires, water heaters, etc.

An AM radio is a low-cost tool to detect higher frequencies, such as most “dirty electricity” on house wiring and the radiation from some types of electronics.

An RF meter measures radio frequency radiation from cell phones, cordless phones and all sorts of wireless gadgets. Such a meter can also pick up the signals from transmission towers outside the home.

Some people with EHS are more sensitive than low-cost instruments. In the end, the EHS patient is the best judge of whether a place is acceptable or not.

The current radiation standards are highly misleading, as they are purely based on the heating of human tissues from exposures to EMF—the microwave oven effect. Much science is now available which indicates that this is an outdated model. Even with reasonable lower standards, people with EHS are unlikely to be protected, just as the food safety standards do not address the needs of people with food allergies.

Very little help is available to the EHS patient today. The exception is in Sweden, which has taken the lead from the very start. The Swedish Confederation of Professional Employees (or TCO) started publishing standards for low-radiation computer screens already in the 1980s. These standards have been improved since that time and are adhered to by most manufacturers today, but are still inadequate for many EHS sufferers.

Swedish social services sometimes pay to electrically “sanitize” the homes of people with EHS and even rent out remote homes to the severest cases who cannot live near populated areas. Four Swedish hospitals now have specially outfitted facilities to accommodate people with EHS.

Some Swedish churches now have cell phone free/non-electric services on a regular basis. The Swedish utilities have developed low-EMF smart meter setups and opt-outs, and various other accommodations are available to Swedish citizens with EHS.

All is not well there, however. People with EHS are still being met with disrespect by some public authorities. There have been several attempts at creating low-radiation zones where cell phones still can be used, but there are restrictions on the siting of cell towers. So far, the cell phone industry has been able to block these zones from being legally binding.

On May 2, 2008, the front page of the French magazine *Le Monde* featured a portrait of a person with EHS. The article in this respected magazine did much for the acceptance of EHS in France.

In 2012, the Austrian Medical Association recognized EHS by issuing a set of guidelines for their physicians.

Research results

Some interesting results have been documented in lab tests, but these need to be verified and enhanced to be considered scientifically valid. There is still no theory to explain the phenomenon of EHS. A theory needs to be found that explains the illness, and then it must be validated before the medical community will accept it. So far, some theories have been floated that attempt to explain parts, but not the whole. There is very little funding available and it is not a field that promises fame and fortune at this time. The few researchers in the field are often denied funding and put under pressure by special interests. Thus, it does not attract much research talent.

Henry Lai at the University of Washington has found that EMF at very low levels can damage the DNA in rat brains. The University of Lund, Sweden, has done extensive studies of EMF effects on rat brains and repeatedly documented that cell phone radiation causes the blood-brain barrier to become leaky, which means that a person who is exposed to chemicals and a cell phone at the same time has a much higher risk of the chemical affecting the brain. This may explain why there seems to be a link between EHS and multiple chemical sensitivities (MCS).

Several studies have showed that exposures to cell phones can activate the immune system. This doesn't mean it damages it, but the hypothesis is that over time, the immune system can become exhausted and possibly lead to various immune system illnesses, such as perhaps allergies.

There have been human studies as well. A French study of workers showed that their levels of white blood cells were lower when they worked near a building transformer and higher once they were moved away. Once they were moved back near the transformer, their levels dropped again.

A Swedish professor of dermatology discovered that he could see microscopic changes in skin cells on people when they used computers, compared to when they had not used them for several hours. This may help explain why some EHS sufferers have skin problems, such as flushing, tingling and burning.

Dr. Kirschvink, a researcher at CalTech, discovered that human brains contain microscopic magnets (magnetite crystals), just as many animals do. Migrating birds are known to rely on these magnets to navigate using the earth's magnetic field. The existence of these magnetic receptors in humans may be another clue to the puzzle.

A psychiatrist in Boston noted that people who are depressed get a mood lift when exposed to the electromagnetic field of an MRI machine. Dr. Rohan is now experimenting with using it as a therapy device.

It is well known that driving a vehicle while talking on a cell phone raises the risk of an accident. Several countries and states have banned cell phone use while driving. Most people think the reason is the distraction, but several studies have found that the radiation from cell phones slows the response time for various cognitive functions, which may be another factor.

Some studies have looked at whether EMF affects children. The rate of children with behavioral disorders, particularly ADHD, has risen sharply over the past fifteen years. The reason may be the increasing radiation exposures from cell phones, Wi-Fi, etc.

Dr. Aldad and his team of researchers at Yale University exposed pregnant mice to cell phones. They found that when the baby mice were born, they were more likely to be hyperactive the more they had been exposed to a cell phone while in the womb.

A study on 3000 children and adolescents in Bavaria, Germany, found that the adolescents with the highest exposures had more than double the rate of behavioral problems (hyperactivity, etc.)

A large study of 13,159 Danish children found that when the mother used a cell phone, the child was 80% more likely to have behavioral problems at the age of seven. An Egyptian study found that the heart rate increased in fetuses, while the pregnant mother was using a cell phone.

Cell phones also appear to create fertility problems, according to the Cleveland Clinic. A study there found that cell phones decreased men's sperm quality in several ways.

Wireless transmitters may not be the only culprits. The low-frequency magnetic fields from wiring and appliances may also have an effect. A group of doctors at the Kaiser Foundation in California measured the low-frequency magnetic fields that 626 pregnant mothers were exposed to. The children were followed for thirteen years. Those exposed to the strongest magnetic fields in the womb were most likely to develop asthma.

There have been a number of experiments where EHS patients have been exposed to EMF and their symptoms recorded. Some of these experiments have shown effects, others have not, casting doubt on the validity of the claims that EHS sufferers make.

It is very difficult to set up well-designed experiments that really produce clear-cut results. The most common problem is that the experiments do not remove all unintended exposures of EMF, which may interfere with the results. In many of the studies, what the authors call the “sham conditions” is just as active as what they call the “active condition”. In many of the experiments, a computer is used in the same room as the test subject occupies, for instance. The researchers have clearly not understood the magnitude of the problem. That is like trying to judge whether someone is bothered by a single cigarette with the person sitting in a smoky room.

Many studies have treated their test subjects as a homogenous group, where each individual has similar reactions to the same exposures, and on the same time schedule.

There is no definition of who has EHS and who does not. Most studies have no criteria for selecting test subjects, other than the person believing they have EHS. Some test subjects may have other health issues, which they incorrectly attribute to EMF.

Another problem is that some people tend to be more sensitive to certain frequencies than others. If the experiment does not use a frequency that is bothersome, the patient may not have a reaction—at least not at low levels.

Delayed reactions are another problem. The test person may first be in pain after being led out of the test room, or the reaction may first show up later while a placebo is given, thus “proving” that the sensitivity is not real.

Finally, test persons easily tire out and can no longer tell anything different. The exposure from their transportation to the test site can often be enough.

A well-designed study needs to be conducted in a low-EMF location and must allow the test persons to acclimatize to the test location, so symptoms caused by the place itself can be noted. The often-cited study at Kings College in London took place in a building which gave several participants such severe symptoms that they left soon after arriving.

Many of the most sensitive people would not be able to participate in studies, as the effects from the exposures could be severe and long-lasting.

A notable experiment was done by William Rea in Texas, involving 100 people, who were screened to ensure they had reproducible EHS symptoms. No other study has used such a screening. The experiment showed that people can be more sensitive to certain frequencies than others, which may explain why some people with EHS can drive a car, but not use a computer, or some can use a cell phone but not be near a power line. Sixteen people were able to correctly identify the 32 active challenges and the 160 placebos in a random double-blind test. The experiment has never been repeated, according to Dr. Rea.

One cleverly conducted experiment (though with computers present) was done in Holland. A mini-cell-tower was installed in a shielded room and a group of EHS sufferers and controls were exposed. The surprising result was that the control group was affected by the radiation as well. The radiation was found to have a stimulatory effect, which supports the observation that some EHS sufferers become restless when exposed to EMF.

David McCarty et al of Louisiana State University exposed a physician with EHS to an electrical field, similar to what is found in an ordinary home. The experiment was double-blinded in a controlled environment. The test subject was exposed 300 times to an actual electrical field and 150 times to a placebo (no field). Her symptoms correlated very closely with whether she was exposed to the pulsing electrical field or not.

A Swedish study connected a group of people with EHS to heart monitors for 24 hours. It found that the group had disturbed heart rhythms compared to a healthy control group. The pattern was similar to people with fibromyalgia and different from people with panic disorder.

Other experiments have shown EMF to affect a person's ability to pay attention and that it may change brain patterns in humans. The ability of a person to sense a low current has also been shown to vary much more than was previously thought.

Some studies have tried to estimate how many people suffer from EHS or are bothered by EMF to some degree. A telephone survey of 2072 Californians showed that 3.2 percent reported being sensitive to electronic devices, while 0.5 percent reported being bothered so much they had to change jobs or stop working entirely.

A much larger survey of 15,000 people in Stockholm, Sweden was published in 2002. It showed that 1.5 percent thought themselves to be sensitive to EMF. A 2007 systematic study of 20,000 people in Colchester, Great Britain, found 4 % to be sensitive to EMF, using a stricter criteria than the earlier surveys.

A compilation of 17 prevalence studies concluded that there is a rising trend: more and more people become affected.

Chiara De Luca noted that out of 620 MCS patients seen in an Italian clinic, about 35% also had EHS. Thus there appears to be a link between the two syndromes.

The studies mentioned are listed at the end of this article.

Conclusions from research

That electromagnetic radiation affects human cells was already determined by 1995, when Dr. Goodman at the University of Wisconsin reviewed two hundred published cell studies. He concluded that “current evidence suggests that cell processes can be influenced by weak electromagnetic fields” even though “one would not expect a cell to respond at all”. This didn't mean it was necessarily harmful to humans.

In 2002, the World Health Organization concluded that low-frequency EMF can cause childhood leukemia. The burden of proof is very high before this organization issues any conclusions.

Then in 2007 arrived the *BioInitiative Report*, which was produced by a group of independent researchers and public health professionals from five countries. In this 600 page report, they go over all the available materials from many fields of research associated with EMF exposures. This is possibly the first comprehensive cross-disciplinary document ever done on EMF issues.

The report concludes that there are still many things not understood, but there is ample evidence that the current radiation standards are not protecting the public health, and now is the time to take policy action. Waiting until the full proof and understanding is available is not warranted and will cause enormous cost and disruption to society.

The Council of Europe is an advisory body to the European Parliament. In 2011, it issued resolution 1815, which recommends reducing EMF exposures in the population and the introduction of measures to protect people with EHS.

Also in 2011, the World Health Organization classified radio-frequency EMF as a Class 2B probable carcinogen.

In the past decade, there have been several statements of concern made public from various gatherings of physicians and scientists, such as the Freiburg Appeal, Irish Doctors' Environmental Association, Benevento Resolution, etc.

In recent years, the supreme courts of France and Italy have both concluded that there are health effects from living near transmission towers.

It is becoming increasingly difficult to ignore these problems.

Controversies

It is normal for an emerging syndrome to be controversial while science slowly works through all the issues. A full understanding is likely to take decades. Even sixty years after the first studies showed that tobacco causes cancer, the issues there are not yet fully understood. Fortunately, society has decided that a full understanding is not necessary before warning people about the danger of tobacco.

When special interests are threatened by medical research, they tend to mount campaigns to keep the issue controversial in the eyes of the public. This has happened several times already, most notably with lead, asbestos and tobacco. Special interests, especially the cell phone industry, have been very successful at keeping health effects from EMF controversial by funding research to cast doubt on the issue. Swiss researchers Huss et al. has shown that only 33% of industry-funded research finds any health effects, while 82% of independent research does show effects. This “funding effect” is a general phenomenon, which is documented very well.

Several influential organizations, such as EPRI, IEEE, FCC and ICNIRP, have close ties with the industry, and generally support their interests.

There have been some issues with conflicts of interest among scientists in this field. A few scientists have been willing to testify on behalf of the industry, which is highly paid. The chairman of the very influential World Health Organization IARC committee was asked to step down when it came to light that he co-owned a firm that lobbied on the behalf of the cell phone industry.

It is sometimes said that much research is no longer relevant, as it was conducted on yesterday's technologies — such as analog cell phones. This is the same as saying that red cars may kill you in a collision, but we don't know about blue or green cars.

Another ploy is to demand absolute certainty, which will take many years to obtain. Meanwhile, in the absence of certainty, no warnings or restrictions should be employed, of course.

The special interests are strongly opposed to the acceptance of EHS, as the very existence of EHS is proof that there can be health effects from EMF.

Recommended literature

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