Electrosensitivity:
A Patient with Burn-like Skin Manifestations

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This report describes a patient with preexisting multiple chemical sensitivity who has developed a pronounced electromagnetic hypersensitivity. According to the patient, he is even able to distinguish various sources of electromagnetic fields (e.g. Wi-Fi, DECT or cell phone, DVB-T TV). His symptoms range from skin manifestations, which require treatment, to hypertension and brain-related disorders as well as intestinal bleeding. The unusual skin reactions, which look like burns and have occurred several times, appear to be especially worrisome. An explanation of what caused them is still lacking.

Introduction

From a scientific perspective, the phenomenon known as electrosensitivity is still mostly unresolved. The terms electrosensitivity/electrosensibility are used in various ways.
In common language, electrosensitivity refers mostly to the ability to consciously perceive electromagnetic fields (EMF). Since this is often associated with unpleasant sensations, it is also referred to as “electromagnetic intolerance.”
The terms “electromagnetic hypersensitivity” or “electromagnetic sensibility” are preferable because they also reflect the effect of the magnetic component.
Hecht (HECHT 2001) describes electrosensitivity as a stress symptom due to electromagnetic field exposure that triggers a variety of symptoms, even though these fields are not consciously perceived.
On the other hand, electrosensibility refers to the ability of consciously perceiving electromagnetic fields, which, for example, is the case in people with preexisting neurological disorders. This is contradicted to some extent by, for example, a study of the federal occupational health and safety agency (KAUL 2009), which disputes the existence of this kind of ability.

Bevington from Electrosensitivity UK, a charity for people sensitized by electromagnetic radiation, makes very fine distinctions between *subconscious sensitivity,* associated with the electromagnetic functioning of the organism; *conscious sensitivity,* associated with an unrecognized electromagnetic exposure and which also occurs in a dose-dependent manner in the vicinity of cell towers; *conscious sensitivity,* associated with the conscious perception of electromagnetic fields as such; and *conscious hypersensitivity,* which is experienced as an impairment and seems to include physiological changes. For practical purposes, the less precise term electrosensitivity will be used in the remainder of this paper.

Description of Case History

The description of Mr. Z’s case history presented here is based on my personal conversations with Mr. Z in my office; the filled-out health status questionnaire concerning symptoms caused by radiofrequency electromagnetic fields from Dr. Waldmann-Selsam (WALDMANN-SELSAM 2006); the expert assessment by Prof. H. Konietzko, Institute of Social and Occupational Health at Mainz University, submitted to the social welfare court in 1988; the reported findings of his treating physicians; photos stored on a CD; and a file memorandum of his employing company Mr. Z left with me.

Symptomatology

Mr. Z (name changed), 55 years old, precision mechanic by trade, retrained to become a machine tool technician, came to see me in my office for the first time in the beginning of 2009. He describes various symptoms he suffers from and claims to be associated with wireless radiation exposures. His symptoms are especially bad during foggy weather. For example, he develops a kind of sunburn in the face and neck area, which may persist for several days (see Fig. 1, one day after being in the rooms of the university).

He has shielded three sides of his home with copper mesh sheets embedded in plaster and with screens across the windows. At his workplace, DECT cordless phones and Wi-Fi networks are used. He can hardly be there anymore.

Out of the 84 symptoms listed in the questionnaire, 46 of them, as listed in Table 1, are marked by Mr. Z as occurring "often" and "frequently." The symptom "diarrhea with blood" was added by Mr. Z himself.

He also reports to specifically respond to UMTS with stomachaches and diarrhea. Wound healing is poorer than in the past. He notices more and more age spots on his skin. Owing to their suspicious appearance, several of them have been excised during various visits to the dermatologist. He develops blisters in his armpits and the back of his knees during sunny weather.
According to him, there are 20 cell antennas and 20 microwave relays within a 1.2-km radius (17 antenna locations within 3 km) in addition to railway radio, ham radio, private mobile radio at a 250-m distance as well as DVB-T stations in the vicinity of his house (in a midsize industrial city). The various transmitter sites continue to be expanded.
TETRA and WiMAX are being added. When on the highway, he says, he can sense the transmitters as he drives by them because his eyes start to cramp and his visual field is narrowed.
He describes his response to DVB-T TV with a burning sensation in his bones. When he walks into his workplace or some other exposed location, he rather quickly develops such symptoms as nausea and watery stool, concentration difficulties and difficulties finding words.

Figure 1: Sunburn-like symptoms in the neck area
The areas not reddened are probably associated with interferences in the near field of his raised shirt collar (according to Mr. Z).

Problems to fall asleep	Slow wound healing
Frequent waking up	Skin manifestations
Waking up groggy/hungover	Burning skin sensation
Chronic fatigue	Tingling skin sensation
Increased need to sleep	Sensation of numbness
Lack of drive or motivation	Itching
Aversion	Allergic reaction
Headaches	Rapid heart beat
Pressure in the head	High blood pressure
Drowsiness	Difficulty breathing in spasms
Discomfort	Dizziness
Sensations of heat (circulation problems)	Sensation of internal burning
Sensations of cold (circulation problems)	Compulsive, repetitive thought patterns
Vestibular disorders	Eye pain
Visual disorders	Swollen eyes
Concentration difficulties	Odor sensitivity
Writing errors	Hair loss
Learning disorders	Weight gain
Forgetfulness	Nausea
Difficulties finding words	Diarrhea
Speech errors	Night sweats
Joint pain	Grinding of teeth at night
Soft tissue pain	Diarrhea with blood

Table 1: Symptoms that occur "often" or "frequently" as reported by Mr. Z

When he works for two to four days in a row at the company, he says, he develops intestinal bleeding. It has already happened to him—when he was out in the city at an agency or at his doctor's office—that he was having a hard time even being able to leave the public washroom he had so hastily retreated to. During exposures, his head turns hot; his blood

pressure has been elevated for some years. Last year he has gained weight, ca. 15 kg.

According to Mr. Z, there are many cancer cases in the street he lives and in neighboring streets. His second wife died of lung cancer; the highest exposures were right above her bed.
Mr. Z also reports of problems in doctors' offices and outpatient departments of hospitals because other patients use their cell phones, a DECT cordless phone sits at the table, etc. He broke off a scheduled MRI scan when he started to feel sick in the preparation room.

Development of symptoms attributed to electromagnetic fields
Symptoms started ca. 1996-1998 during exposure to DECT phones (phone calls) or while staying in exposed areas (headaches, "migraine," visual disorders, gastrointestinal problems, skin eruptions).
In 2000, workplace was moved from a room with steel-reinforced concrete to an open-floor office with ca. 25 DECT cordless phones, including computers, printers, and copiers. After that, additional symptoms developed (circulatory disorders, blood pressure disorders, concentration difficulties, compulsive ruminating, joint pain) and an increase in the intensity of the symptoms.

The most aggravating change occurred in 2008 when the furniture of his department was rearranged (four desks grouped together as a block); the Wi-Fi repeater was installed at a 2-m distance directly above Mr. Z's head.
Several times the company medical officer sent him directly from work to his primary care physician. Within 1200 m of the company, there are five cell phone, microwave relay, and rail radio transmitters; TV transmitter is at 2000 m.
Due to shielding, he tolerated his home environment quite well in the beginning. After activation of digital TV on 6 November 2011, severe symptoms have reoccurred.

Preexisting conditions
Because of significant discomfort (drowsiness, numbness, nausea, also back pain due to heavy lifting and stooped posture), in 1988 an injury due to chlorinated hydrocarbon (perchlorethylene, trichlorethylene, Freon, acetone, etc.) was acknowledged as an occupational disease through Prof. Konietzko, Mainz, and retraining as a machine tool mechanic was approved.

1993	Dermatologist: seborrheic eczema
1996	Orthopedist: cephalgia, vertebralgia, Sensation disorders in arms and legs
7/1996	Cholecystitis with cholelithiasis, operation recommended
1998	Dermatologist: seborrheic eczema of head, face, and sternum
9/1998	Abdominal CT. Cholelithiasis with large and small concrements. Colposcopy: fleabite-like, focal bleeding, histological finding of mucous membrane not unusual. Porphyria diagnostics was planned, not performed.
5/1999	Suspicion of allergic conjunctivitis, chronic rhinitis
3/2007	Lymphopenia, neutrophils somewhat reduced
2007	Histological finding of gastroscopy: antrum chronic gastritis type C, no helicobacter. Corpus: minor gastritis C; small intestinal mucous membrane not unusual. Esophagus: as in reflux esophagitis I-II.
2008	Multiple nevi removed
5/2007	Arterial hypertension
4/2007	IgE considerably increased (182 IU/ml). Lung function without pathologic findings. No specific antibodies, no eosinophils.
6/2008	Ophthalmologist: emerging cataracts
8/2008	Long-term ECG and blood pressure recording. Daytime maximum: systolic up to 176, diastolic 121 mmHg; nighttime systolic up to 176 and diastolic up to 103 mmHg
8/2008	Neurological examination, EEG, evoked potentials not unusual, symptoms in association with electromagnetic radiation exposure, "perceptual experience."
6/2008	Evidence of tachycardia and extrasystoles. Exercise ECG: maximum performance with 175 W

Table 2: Available medical findings

In the subsequent position as a service field technician, discomfort due to automobile exhausts, perfume.

1988: Automobile accident with concussion and fractures of both hand wrists; also broken scaphoid bone of the left hand, which was treated with a metal screw (composition unknown). This screw was left in place.
2002: Tonsillectomy with circulatory collapse, ICU.
Existing amalgam fillings: ca. 4.
Alcohol: On average one beer per day.
Nicotine: 10-20 cigarettes per day.
Medications: Coversum Combi 1 tablet a.m.; Metohexal Succ 190 mg b.i.d. 1 tablet, Amlodipine 10 mg h.s.

The available medical findings are presented in Table 2.

Social and Family History

Both parents are originally from what is now Poland, from where they had been expelled after the war.
Father (+ 33 years) worked in the same company as Mr. Z, had bypass operation seven years ago. He is described as a hardworking and strict person; he beat his son regularly, but he also taught Mr. Z manual skills.

Mother (+ 31 years), died of heart insufficiency. She worked at a bakery, had to help to earn the money for their own house. Good-natured character.
Mr. Z grew up as a single child; the parents refrained from having more children supposedly because of financial reasons.
Education: Graduated from high school, good grades only in mathematics, later in English. Vocational training as a precision mechanic. Worked for 15 years at the same company; because of multiple chemical intolerance full-time retraining for two years. Subsequently, he works at the same company as service field technician.
Partnership and sexuality: In the past rather shy of women, female relationships relatively late in life.
First marriage 1983, 1988 wife dies in an automobile accident. In 1992 second marriage, two children, wife dies of lung cancer in the house where Mr. Z now lives. 2004 marries again. Wife has similar symptoms like him.
Libido: Sometimes decreased.

Current occupational status
In the past, he has been content with his current workplace, and he had thought that he would work there until he is going to retire. Now he is confronted with mobbing. With his superior's approval, he took some measurements and also hired someone to take measurements. Thereafter, he was gagged. He was no longer allowed to inform his coworkers of the prevalent EMF exposure levels. The quality of the work at this company has deteriorated, production goals are not reached anymore, but nobody seems to care. At the moment, I am "allowed to unpack computers"—these rooms are less polluted with EMF.

Extremely low frequency (ELF) and radiofrequency radiation (RF) measurements
RF measurement results (obtained with Gigahertz RF meter HF59B with isotropic antenna UBB27-G3):
RF level on main floor of his home: between 5 and 280 µW/m^2, whereby RF levels could fluctuate within a few centimeters between 2 and 280 µW/m^2 in areas of so-called "bubbles" caused by interference.
Second floor of his home: between 10 and 400 µW/m^2 with several "bubbles." Garden: between 2 and 400 µW/m^2. At his workplace within a 2.5-m radius: RF levels range from 3,000 to over 20,000 µW/m^2 (overload of RF meter).

ELF measurement results (with Gigahertz meter ME3951A):
While the main panel is turned off, measurements in the home and garden reveal AC magnetic fields from 2 to 140 nT that fluctuate by the minute, around 9 p.m. they increase to 120 up to 220 nT; origin not clear.
At his workplace, a nonlocal technician measured Mr. Z's desk. Mr. Z positioned the field probe in such a way that the maximum value could be captured, which exceeded the exposure limit. After that, the technician moved the field probe and measured only ca. 50% of the exposure limit! Because Mr. Z paid attention, this could be detected.

Findings

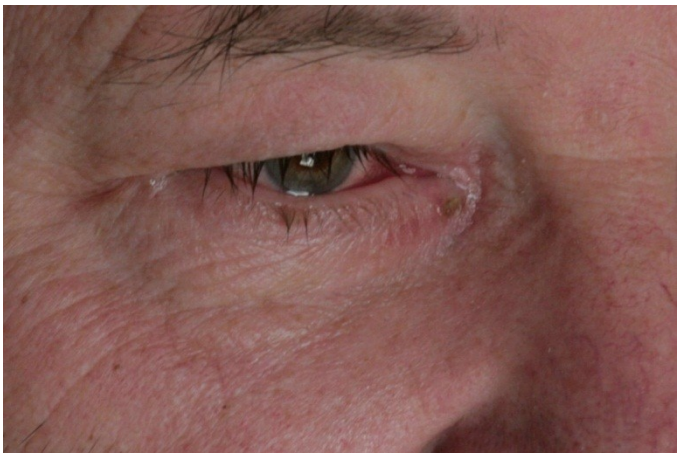

Figure 2: Clear swelling of face with swollen eyelids

Somatic findings: Light skin type, gray hair, considerable obesity, clear swelling of face with swollen eyelids (see Fig. 2). Skin appearance nonuniform with multiple nevi of varying size, shape, and color; eczematous changes in certain areas, probably also with mycoses, senile warts, small hemangiomas.
Psychological findings: Mood tends to be elevated. Subjective: Mr. Z complains about memory retention and concentration problems, memory impairment, reduced performance capabilities, speech and word finding problems. His spontaneous description is somewhat random, hectic. Without having been asked for this, Mr. Z shares information about shielding possibilities, his subjective perception of the radiation exposure in the doctor's office, RF radiation at the monitor, etc. He bubbles over with ideas, responds quickly, like drugged, sometimes witty, but also irritable.

Considering the big picture, these symptoms are most likely associated with brain-related disorders. No paranoid notions, no hallucinations, no evidence of depression, no contact disorder. Well-rounded intelligence, good technical understanding, willpower, and determination. No evidence of major neurotic traits.

Diagnosis
I make the diagnosis of electrosensitivity (ICD Z58: Problems related to physical environment) and microwave syndrome (T66), in order to characterize the severity of the symptoms more appropriately (ICD section "Other and unspecified effects of external causes: radiation sickness" T66).

Further Course of Development
Attestation of inability to work and recommendation to change workplaces within the company. Mr. Z said that the

company has no interest in the continued employment of him. In September 2009, company representatives met with him to discuss his leaving of the company and offering him compensation.

Figure 3: Burn-like manifestations in the right groin area

At the instigation of the pension insurance company, a healing therapy at a psychosomatic rehabilitation clinic was scheduled. Mr. Z broke off his stay after only four hours because of high chemical and RF radiation exposures. He complains that fellow patients use DECT cordless phones, cell phones, and Wi-Fi. The clock radio next to his bed could not be disabled. As far as chemicals are concerned, he noticed disinfectants, perfume, and chlorine-containing cleaning products in the washroom.

At the beginning of 2010, Mr. Z comes to see me again and shows dark red, shiny skin patches in the right groin area and less pronounced on the abdomen, which, according to him, caused him a burning pain. He reports that they appeared very suddenly from one day to the next. In the past, he has already experienced something like this on his abdomen and the left side of his chest. Some of them oozed fluid. The local dermatologist referred to it as eczema.
The larger patch is oblong-oval, ca. 4 cm in length, rough, somewhat raised, with clean, sharp edges, with relatively smooth, only slightly wrinkled surface, similar to a burn from touching an electric range or the mark of direct contact with an electric current.
To the question whether metals could be involved, he replies that he usually carries a pack of cigarettes with metal-foil paper in his left breast pocket, a set of metal keys in his pant pocket; the rivets of his jeans and the belt buckle at the waist also contain metal.
The lesions occurred one day after he most likely had spent time in areas of particularly high RF radiation exposures (vicinity of regional airport, vicinity of border in the east).

Summary of Symptoms

Mr. Z was mostly healthy until developing multiple chemical intolerance. Lipophilic cleaning products, which he had to use on a daily basis, are preferably stored in the brain and nerve tissue. Even though the complaints about this are not a priority right now, we must assume that a general sensitization to chemicals has occurred. An indication for this is his excessive perception of automobile exhaust and perfume during his position as service technician, of disinfectants in the rehabilitation clinic, and possibly the incident during the tonsillectomy. Metal incorporation also exists: tooth fillings, metal screw.

According to Mr. Z's credible report, he has suffered over the last several years especially from the exposure to electromagnetic radiation, which triggers a multitude of symptoms that considerably impair his everyday life. He can even distinguish between the different sources of electromagnetic radiation (Wi-Fi, DECT cordless phone, cell phone, DVB-T TV). In Germany, this phenomenon is referred to as electrosensitivity or preferably electromagnetic hypersensitivity.

Discussion

We do not yet have an established and generally acknowledged explanation for the phenomenon known as electrosensitivity/electromagnetic hypersensitivity. The preexposure to chemicals and metals is typical. Mr. Z acquired multiple chemical intolerance at his workplace; the change of career could not prevent the increase in reactions.

No specific treatment has been applied. Metal and chemical exposures, known to lead to systemic inflammations, as well as other inflammatory processes seem to act as predisposing factors. As time goes on, the severity of symptoms grows worse, more and more symptoms manifest, more and more radiation sources trigger adverse reactions.

Mr. Z's current symptomatology includes a variety of symptoms that impair his well-being, e.g. sleep problems, no restorative sleep. Some of his individual health symptoms and sensitivities are experienced as far more severe and debilitating than the simple terms suggest. According to numerous studies, this can be traced back to a reduced production of melatonin (ROSEN 1998, quoted in SCHEINER 2006). Hypertension, more frequent tachycardia, reflux esophagitis, gastritis, intestinal bleeding, eczema, all of these are clearly to be classified as a disease. The cataract formation indicates a premature aging of the lens body.
Beside the prominent nevi with a risk of malignant degeneration, the intestinal bleeding appears to be especially sinister.
Hypertension associated with maximum nighttime values is

also quite typical. Gastrointestinal symptoms and reflux disease also often indicate disorders of the autonomic nervous system, whereby the sympathetic portion is dominant. Brain-related disorders, which often are not recognized as such, e.g. restlessness, agitation, irritability, logorrhea, and concentration difficulties lead to problems in the social interaction with fellow humans.

And when this is compounded by major memory impairments, as is also seen in other sufferers, other people get the impression that such a person is unreliable, confused, and disorganized as with emerging dementia. Magda Havas from Canada is right in referring to this disorder as rapid aging syndrome (HAVAS 2009).
Behind the shielding in his home environment, Mr. Z had been doing quite well until the activation of the DVB-T stations—though with varying levels of success, depending on changing external conditions and body performance.

Reddening of the skin and sunburn-like manifestations have been observed occasionally (see e.g. GARCIA 2010). Johansson explains this with an increased release of histamine and an increased formation of mast cells. Apparently, these skin manifestations have been observed in Sweden more frequently, e.g. in persons who work with VDTs (JOHANSSON et al. 2001).

For me, the above-described burn-like skin manifestations—which leave scars when they heal—are out of the ordinary. The following questions must be asked: What are these? What is their cause? Experts in the field of electrosensitivity have been unable to give me an answer. Burns have been described by tests of the US military (FORSAR & BLUDORF 2009). I suspect that in addition to Mr. Z's general metal load, the presence of metal at the location of the skin manifestations is important (metal-foil paper, set of keys). Could it be toxic contact eczema? The latter is usually strictly limited to the area at which contact with the toxic substance occurs. It can be triggered by ultraviolet radiation or ionizing radiation. Why not also by other types of electromagnetic radiation?
Mr. Z's statement about the timing of the skin manifestations, namely after having spent time at probably highly exposed areas (e.g. airport or borders) is of great importance. Provided that the skin manifestations could be a result of radiation exposures, could the radiation in question be radar radiation?[1]

In my opinion, the case of Mr. Z is of exemplary importance. Since physicians, in general, focus on the major symptoms during examination and treatment, the multitude of impairments and restrictions the patient is affected by often eludes them. Most of the time, it is up to the patient to make the connection with electromagnetic fields and to suggest a suspected diagnosis. This causes further difficulties because the WHO under Repacholi's leadership presented the term "idiopathic environmental intolerance related to EMF (IEI)" to the public at its Prague Workshop in 2004 (WHO 2004). At this workshop, Hillert recommends cognitive behavioral therapy as a therapy (see also HILLERT 2001). In December 2005, the WHO advises to have a psychiatrist perform an assessment and symptomatic treatment, and thus, without explicitly stating so, insinuates a psychological cause (WHO 2005b).

For this set of symptoms, it is common practice today to order a psychiatric assessment. As far as diagnoses go, fatigue or somatoform dysfunctions are suggested. (Please note that there is no acknowledged definition of somatoform dysfunctions. This is a diagnosis of exclusion, whereby neurologists and psychiatrists do not consider today's multi-system disorders to any extent at all.) Other diagnoses: depressive episode (F32.1), anxiety disorders (panic attacks, phobias, generalized anxiety disorder), delusions when e.g. (see above) the neurologist speaks of "perceptual experience." Because of the diverse spectrum of symptoms and relatively frequent traumatizations—of a sexual or other nature—the diagnosis of post-traumatic stress disorder or borderline disorder is made as well in cases of electrosensitivity.
Because of the symptomatology, affected persons often reach for alcohol and medications so that a dependence syndrome diagnosis is applied (see Tab. 3).

So as to avoid any misunderstandings: These disorders, of course, do exist, but their diagnosis should only be applied—as has been common practice in the past—after having ruled out any physical, which would also include any environmental, causes. In addition, owing to the pervasiveness of electromagnetic exposures, it is also possible that both phenomena coexist.

Conclusion

Over the past couple of years, the annual reports of the health care insurance companies (e.g. DAK 2010) regularly state that mental health disorders are on the increase; the insurance company for technicians and technologists recorded a 40% increase over the past 10 years (TK 2010).
In my opinion, many cases of electromagnetic hypersensitivity are disguised as psychiatric but also orthopedic diagnoses (pain syndrome).
These individuals are often not able to work anymore and frequently they are not even able to lead a normal life in their home environment; they are at risk to loose friends and family. Social exclusion is another risk. Since physicians—in

1 I would appreciate any feedback.

agreement with the WHO—assign the cause to an individual psychological problem, the socio-political significance of rapidly increasing electrosensitivity is diffused.
Due to the level of electromagnetic pollution in Germany, individual solutions are almost impossible. For true prevention, intervention strategies by the government are required.

Diagnosis	ICD 2005
Fatigue syndrome (neurasthenia)	F48.0
Somatoform autonomic dysfunction	F45.3
Persistent somatoform pain disorder	F45.4
Depressive episode	F32
Anxiety disorder	F40, F41
Schizophrenia, e.g. paranoid schizophrenia	F20.0
Post-traumatic stress disorder	F43.1
Emotionally unstable personality disorder – impulsive type	F60.30
Borderline personality disorder	F60.31
Dependence syndrome via psychotropic substances	F10.2, F13.2

Whether drastically reducing radiation exposures is sufficient or whether completely abandoning them is necessary—this debate is set to remain with us for some time yet.

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