Electromagnetic fields and other environmental stressors all disrupt homeostasis in the same way

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Abstract

People with a hypersensitivity to certain environmental factors ("stressors") will suffer from artificial electromagnetic fields (EMF), smells from synthetic compounds, low-frequency sounds and ultraviolet light. Their stress system is activated, leading on the short term to sleep disruption and other stress related symptoms. On the longer term, chronic fatigue and a variety of medical ailments may follow. Stress development thus seems to be a 2-step process, whereby individuals show a variation of complaints, depending on their genetic make-up, earlier experiences and resilience. The cure is to eliminate or avoid the stressors, preferably in the first phase of stress.

Early stress symptoms show relatively little variation. In later phases, complaints and diseases vary wildly and some of them require medical attention. It seems that at later stages, homeostasis is seriously disturbed. then. The removal of stressor may help no longer because the disease has taken over control.

Suffering from environmental or internal stressors

A surprising number of people suffers from their environmental sensitivity, that is they perceive and react on triggers in the environment that are so weak that most others do not even perceive them [1]. Examples are electromagnetic fields [2], odors [3], sounds [4], sunlight [5], or many others, including psychological calamities such as post-traumatic stress disorder [6], chronic fatigue syndrome and other chronic multisystem diseases [7]. The physiological background is often unknown [8], and medical services cannot diagnose these ailments.

The health problems reported show a wide but predictable variety of symptoms, usually with a chronically disrupted sleep/wake pattern as the initiating ailment, with serious negative after-effects on well-being. Their sensitivities are designated respectively as electrohypersensitivity (EHS), multichemical sensitivity (MCS), chronic polymorphic light dermatosis (CPLD) and Low-frequency sounds (LfS). Moreover, there is overlap in types of sensitivities: being sensitive for EMFs enhances the chance of being sensitive also for odor and noise [3, 9], and other external and internal stressors.

Actually, it seems that sensitized people by whatever environmental trigger, are prone to develop a sensitivity for other triggers as well. This blog is meant to illustrate that fact for some environmental triggers (‘stressors’) common in the Netherlands.

Physiological stress

According to Hans Selye’s ‘*general adaptation syndrome’* [10], men, and other vertebrates are equipped with a stress center in the hypothalamic vegetative centers and the hypophysis. Threats are answered in standard way by the autonomous nervous system, the endocrine, and immune systems.

Some 1,5-5 % of the population appears to be receptive (‘sensitized’) for signals that others don’t notice [11]. Signals that by-pass the regular sense organs, reach the brain along unknown routes, and induce stress reactions. For comparison, the reports of persons with post-traumatic stress disorder (PTSD) were included as well, because their responses to psychological events are of a stress nature as well and might follow the same pathway to the stress centers in hypothalamus and associated brain centers.

Coping with the situation

‘Stress’ is a physiological condition, induced when the individual is confronted with a unexpected hazard, such as a predator [10]. Depending on its mental disposition, the individual choses for either a fight or flight reaction, whichever fits the situation. ‘Sensitized’ fighters recognizing the hazardous

condition they are in will take appropriate action, find out what is the matter, how to cope with the situation, reduce exposure to the hazard and live their life as a person being aware of his or her weakness (hypersensitivity). Flighting people tend to wait and see, waiting for help and find shelter. Their sensitivity will endure and the world remains a place to mistrust. Reliance on help and support characterized their way of living. This is a black/white picture: all of us, sensitives, will be anywhere in between these extremes.

Data collection

I chose a selection of environmental trigger areas, including

- anthropogenic electromagnetic fields EMF, causing electrical hypersensitivity (EHS)[12];
- odors from man-made chemicals for pest control or cleaning causing MCS [13];
- UV-component of daylight, causing chronic polymorphic light dermatosis (CPLD)[14];
- low-frequency sounds (LfS) [15];

I added reports form US officials being employed at US embassies in Havana (Cuba) and claiming to be hit by powerful radiation of unknown source and showing symptoms described here. Later critical inspection of data indicated that high power pulsed electromagnetic fields from unknown locations were involved [16].

I also added data from persons suffering from a posttraumatic stress disorder (PTSD), ever since they were confronted with calamitous psychological experiences [17].
See table 1 for comparison of effects caused by all six groups of stressors affecting our stress system.

Table 1. ***Short-term (1) and long-term (2) health complaints upon exposure. Reply of various groups of environmental victims to questions about the most common environmental stressors causing health problems***

Nature of stressor -> **Illness designation [a] ->** **Health complaint:**	**Rapid (1) or slow (2) response [b] to stressors**	**EMF / EHS** [Ref 11, 18]	**Fragrance / MCS** [Ref 13]	**UV light / CPLD** [Ref 5, 14]	**LF Sound / Tinnitus** [Ref 15]		**Pulsed EM waves'** Stress US Embassy personnel Havana [Ref 16]	**Mental health PTSD /** Ref 17
Sleep/wake problems	1	✓	✓	✓	✓		✓	✓
Chronic fatigue	2	✓	✓	✓	✓		✓	✓
Nervousness	1	✓	✓		✓			
Headaches / migraine	1	✓	✓	✓	✓		✓	✓
Brain fog	1	✓	✓					
Mucous irritation /	1	✓	✓					
Lack of concentration	1	✓	✓	✓			✓	✓
Memory problems	1	✓	✓				✓	✓
Tinnitus / ringing in the ears	1	✓	✓	✓	✓			
Dizziness	1	✓	✓	✓	✓		✓	✓
Malaise /flu feeling	2	✓	✓	✓				✓
Depression	2	✓	✓		✓		✓	✓
Agression	2	✓	✓		✓			✓
Fear	2	✓	✓		✓		✓	✓
Hart/vascular problems	2	✓	✓	✓	✓			✓
Fibromyalgie	2	✓	✓					
Joint pain	2	✓	✓	✓				
Body/brain vibrations	2	✓			✓		✓	✓
Skin problems / erythema	1	✓	✓	✓				

a) A*bbreviations*: EHS, electrical hypersensitivity; MCS, multiple chemical sensitivity; CPLD, chronic polymorphic light dermatose; Tinnitus, all sorts of endogenous sound sensation; PTSD post-traumatic stress disorder
b) Rate of reactions: effects of 1st or 2nd 'wave' of exposure to stressor
c) Embassy personnel suffered from health problems caused by radiation source of unidentified origin.

Questionnaire data

Over the years, we collected several hundreds of self-reported data from members of patient groups who completed a questionnaire with questions as to the health problems. Complaints were grouped in order of report frequency. Not all questionnaires of the other groups consulted were identical. Questions may have been phrased in a different way, were omitted or much more detailed. All with the result that there was a wide variety of answers. For this purpose, the list of complaints used by the Dutch EHS Foundation was used as a starting point [18] and only those questions were selected that showed most overlap, on the average, with the outcome of the other stressor groups. Table 1 shows all data combined. It comprises both first wave of symptoms upon exposure (rated 1), and the conditions generated under continued exposure without special protective measures (rated 2). Neither the participants completing the questionnaire, nor most authors make that distinction. But for experiments aiming to search for the mechanism of hypersensitivity to develop a diagnose tool for environmental illnesses or diseases, it is essential to investigate health conditions that are definitely related to primary environmental sensitivities.

Unity in group reports of stress symptoms

The complaints most frequently cited are disturbed sleep/wake quality and subsequent events following the bad state of health by sleep deficit. Most other types of complaints are shared by most groups. The consequences of insufficient sleep are a suboptimal brain function and several related hormonal and immune disturbances. Grossly speaking, the human body seems to react in the same way upon early exposure to the respective stressors.

On the other hand, the effects of stressors can be undone by the elimination of that particular trigger, as has been demonstrated for the effects of electromagnetic fields [20]. The effect of stressor removal has been investigated less well for the other stressor victims. The manner in which the human body responds to stressors of different physical, chemical or biological character is consistently similar and reproducible.

In the longer term, during the second step of stress development, other diseases and ailments developed, such as neuroendocrine, cardiovascular, immune function and pain sensitivity [17]. These long-term effects are not the focus of this blog, because they are not necessarily caused by exposure to the stressor. Rather, they develop secondarily, as a result of deteriorated health and physical malaise. An elimination of the stressor is no longer a guarantee for a full recovery of health in this phase.

Identification of a two-phase progression of hypersensitivities

It appears that hypersensitivities imply they develop both short- and long-term symptoms. Without taking action, things get worse soon after the first exposure. Short-term effects are noticed in a matter of minutes to hours after receiving the stimulus, sometimes even almost instantaneous, as in MCS patients smelling irritant odors, or electrosensitives entering a room with Wi-Fi.

In the longer term, more medically based basal health complaints develop as a consequence of deteriorating general health, and malfunctioning immune system. In this advanced phase, personal health situations deteriorate, also after the elimination of stressors. Some of the effects reported: hypertension, heartrate variability, diabetes-type 2, neurodegeneration, genotoxicity, and many others [12]. All individuals appear to exploit his or her own pathway, being influenced by genetic constitution, vulnerability, earlier experiences and social conditions. These second-phase developments have not been considered in this blog.

The data in table 1 include both first- and second-step stress symptoms. For clarity: where we talk about ‘stress symptoms’, we refer to the symptoms appearing shortly after the onset of exposure to the respective stressors. These represent the original expression of actions generated in the program of homeostasis.

Graphical representation of the common problem

Individuals belonging to the four major categories of environmental sensitivities are perfectly normal people, only to be characterized by their unusual sensitivity for environmental clues. The graphic presentation of figure 1 illustrates the fact that all share health problems for one or more environmental stressors. Indeed, some individuals had developed a multi-sensitivity. The combination of EMF with MCS sensitivity is reported rather often [14]. PTSD patients constitute a special case where intrinsic, rather than environmental stressors are the problem. Psychological factors, such as bad memories after psychological calamities, address the stress centers in the same way with the same effects.

One may consider that sensitivity is a trait, complicating life and social interactions. One may also consider it as a badly appreciated gift, enabling a person to detect environmental signals before these become a threat for the entire population. Their early-warning message enable the organism to adjust timely and take precautionary measures to prevent harm [20]. A homeostatic repair mechanism may work properly, before control over body functions is lost by neglect or danger.

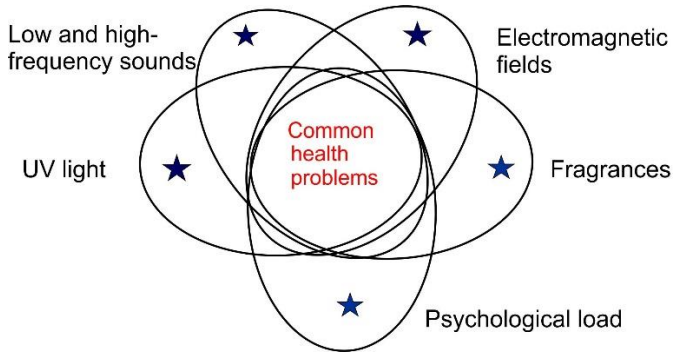

Figure 1. Individuals may develop a hypersensitivity –(loss of tolerance) for one or more environmental stressors (comorbidity). Symptoms of hypersensitivity show a great overlap, apart from stressor-specific common health problems. We suggest that the human stress system, upon being triggered, generates a common program of nervous, hormonal and immune adjustments.

Figure layout inspired by Palmquist [21].

Coping with such environmental stressors

The way people are coping with their sensitivities influences their quality of life. Up till 3% of the citizens report having one or more of the stressors presented here. A complication is that one does not know beforehand in which type of stressor to look for, because the symptoms do not give a clue. A wrong focus may be ineffective. However, several people in the MCS or CPLD group report that avoiding electromagnetic fields is a good start to alleviate symptoms, even when other stressors were involved as well.

One would expect that homeostatic repair mechanisms in the body will take care of malfunctioning processes and regulations, but this is not always the case. If no measures are taken to reduce exposure to the stressor in question, illnesses intensify up to the point that the individual loses control altogether and must rely on help from family members or neighbors within the social setting.

Take-home message

1. For those suffering from any kind of supposed hypersensitivity: stress symptoms such as those presented here are rather unspecific. Check which of the potential environmental stressors is the true cause of your symptoms before undertaking actions to limit exposure.

2. When talking about stress actions, one should refer to the symptoms appearing only in the first phase of stress development. Ailments and diseases developing thereafter are self-inflicted and persist perhaps after removal of stressors.

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