Problems of objective assessment of idiopathic environmental intolerance related to electromagnetic fields

Michael Kundi
Institute of Environmental Health, Medical University of Vienna, Austria
Electromagnetic Hypersensitivity

EXAMPLES
1st Patient

• 42 year old women accountant
• starting to work with a VDT in 1986
• soon after onset of work she had severe problems
  – a sound sensation similar to tinnitus
  – after 5 to 10 minutes severe headaches
• she contacted the occupational physician that inspected the workplace and improved the ergonomic conditions (better chair, adjusting the height of the table – the patient was very tall: 192 cm) but without success
• She consulted another physician because of the headaches
  – he prescribed metroprolol (Lopressor)
• She further tried biofeedback and acupuncture
• The conditions worsened and got only better if she refrained from working at the computer
• The occupational physician sent her to me about 5 months later after attending a lecture where I spoke about EMFs from VDT
  – I performed a thorough case history which revealed that she never had headaches except at primary school
  – She worked at an experimental VDT workplace at my institute for 3 h without any symptom
• I exchanged the VDT with the one from her workplace and this resulted in onset of the symptoms a few minutes after starting to work

• I concluded that the VDTs differed in the features responsible for eliciting the symptoms

The VDTs differed in several features among them the line repetition frequency
• A further interview with the patient confirmed her tinnitus like sensation which she described as a high pitch sound that vibrated

• We exposed her in an acoustic chamber to increasing frequencies produced by a sine generator
  – none of the frequencies exactly matched the tinnitus but a 20 kHz sine came close

• An audiogram did at first reveal no differences from normal

• A high-pitch audiogram at 20 kHz revealed that the patient had an about 20 dB lower threshold than normal
Latest Patient

• 40 year old male employee
• in May 2012 he prepared for a climbing tour at the churches bell tower
• during this preparation he worked about 1 h a few centimeters from a mobile phone base-station
• At the morning of the next day he awakened with headaches and a feeling of numbness of the cheek at the side exposed to the antenna
• During the day he had problems with the left limbs and contacted with his general practitioner – the physician for the first time suspected a relationship with the exposure
• Consultation of a neurologist revealed no abnormalities of MRI
• The neurologist assigned an unclear hemiplegic symptomatology
• The symptoms vanished after 2 weeks
• After returning from sickness leave the symptoms of a tingling sensation and severe headaches returned, however, on the right side
• After 2 months vacation returning to the workplace led again to a reappearance of symptoms
• Unsuccessful efforts for resuming the job led to permanent assignment of disability since September 2012
• Various therapies including psychotherapy didn’t lead to any improvement
• The patient cannot stay for longer than 1 h in an environment with high levels of RF-EMF (especially WiFi and mobile phones)
EHS?

Causes other than EMF (but maybe correlated). Onset often related to new environmental or occupational conditions.

True relationship with EMF. Onset often abrupt and from a singular (high) exposure event. EMF as cause rarely conjectured by the patient.

Attribution to EMF due to misinterpretation of a correlation with symptoms. Association often suggested by media reports, friends or relatives.
Electromagnetic Hypersensitivity

FUNDAMENTAL PROBLEMS
Diagnosis
- Is there a common diagnostic marker?

Provocation test
- Is a provocation test necessary and feasible?

Therapy
- What measures can be taken to improve patients’ conditions?
Exposure

Exceeding perception threshold

Appraisal

of situation

of coping potential

Annoyance

Well-being ↓

Health problems

- negative emotions
- disruption of cognitive processes (ability to concentrate, learning and communication etc.)
Exceeding perception threshold

Appraisal

Annoyance

Well-being ↓

Health problems

- negative emotions
- disruption of cognitive processes (ability to concentrate, learning and communication etc.)

of situation

of coping potential
Well-being \(\downarrow\) often leads to a self-fulfilling prophecy because no objective assessment of exposures.

Is there an explanation from environmental conditions?

- yes: Test the condition
  - often leads to a self-fulfilling prophecy
  - because no objective assessment of exposures
  - ubiquity of EMF in the environment

- no: Search again
Therefore diagnostic procedure is essential

- Thorough case history

At present there is no specific diagnostic marker of EHS. Questionnaires are relevant for a systematic and unified assessment of symptoms but cannot establish a diagnosis! Provocation tests are difficult and at present cannot be recommended.

- if no improvement, establish reduction by measurement, if still no improvement $\Rightarrow$ no EHS
Review

Do People With Idiopathic Environmental Intolerance Attributed to Electromagnetic Fields Display Physiological Effects When Exposed to Electromagnetic Fields? A Systematic Review of Provocation Studies

G. James Rubin,¹ Lena Hillert,² Rosa Nieto-Hernandez,¹ Eric van Rongen,³ and Gunnhild Oftedal⁴*

group. At present, there is no reliable evidence to suggest that people with IEI-EMF experience unusual physiological reactions as a result of exposure to EMF. This supports suggestions that EMF is not the main cause of their ill health. Bioelectromagnetics 32:593–609, 2011. © 2011 Wiley Periodicals, Inc.
Aggregated Data From Two Double-Blind Base Station Provocation Studies Comparing Individuals With Idiopathic Environmental Intolerance With Attribution to Electromagnetic Fields and Controls

Stacy Eltiti,¹,²* Denise Wallace,¹ Riccardo Russo,¹ and Elaine Fox¹,³

not interact with radiofrequency-EMF exposure. These findings are consistent with a growing body of literature indicating there is no causal relationship between short-term exposure to EMFs and subjective well-being in members of the public whether or not they report perceived sensitivity to EMFs. Bioelectromagnetics. 36:96–107, 2015. © 2015 Wiley Periodicals, Inc.
there is a frequent misunderstanding about EHS persons, many do not claim they can sense the EMF – they only have symptoms

• symptoms do often not disappear soon after exposure terminates but persist for some time

Due to these facts it is no miracle that simple provocation tests have not revealed a higher than chance relationship between exposure and effect!

• symptoms are usually non-specific (sleep disturbances, head aches, nausea,...) and do not occur only from exposure to EMF
Criteria for provocation tests

- The test must not induce the symptoms under no-exposure conditions
  - the so called nocebo effect is nothing else than a consequence of a strenuous and unpleasant (laboratory) test atmosphere
- The test must allow differentiation of the probability of symptom appearance from the individual decision criterion about presence of the symptom
- Preferentially the person should not be aware of the test situation
  - if feasible the test should be performed under familiar conditions (e.g. at home) with the person unaware when the test is performed
- Using everyday-life exposure variation is insufficient
- Test conditions must be aligned to the individual time course of appearance and disappearance of symptoms
Project NEMESIS
Christopher H. Mueller, Christoph Schierz
Institute for Hygiene and Applied Physiology, Swiss Federal Institute of Technology ETH Zurich, Switzerland
Conclusions

• EHS or IEI-EMF exists but it is difficult to assess which patient belongs to this category.
• Provocation tests could be important to differentiate between correct and wrong attributions to EMF but must follow criteria that are difficult to meet.
• Specific diagnostic markers do not exist at present but more research is needed to follow some promising paths.
• Scientific debate will persist unless some steps of the pathophysiology can be enlightened.