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Development of the Microwave Syndrome in Two Men Shortly after Installation of 5G on the Roof above their Office

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Abstract

The 5th generation, 5G, for wireless communication is rolled out without previous studies on potential effects on human health and the environment. In this case study we describe two men, case 1 and case 2, working in three office rooms close to base stations. After the deployment of 5G, both men developed symptoms typical for the microwave syndrome, e.g., headache, tinnitus, dizziness, balance disorder, concentration and attention deficiency, and fatigue. Radiofrequency Radiation (RFR) after the 5G deployment was measured in the three offices. In office one maximum (peak) RFR during one minute varied from 463 to 1,180,000 μW/m^2, in office two from 6,230 to 501,000 and in office three from 13,700 to 613,000 μW/m^2. The symptoms disappeared in both men within a couple of weeks (case 1) or immediately (case 2) after leaving the office for other offices with much lower maximum peak RFR emissions, maximum for case 1 =16 and for case 2 =2,920 μW/m^2. This case report may be regarded as a provocation study on health from 5G RFR. The clinical picture in both men was clearly related to the exposure, although the exposures were well below the guidelines recommended by ICNIRP that are claimed to protect against all health effects. We conclude that the guidelines for RFR exposure based only on tissue heating by ICNIRP are inadequate to protect human health and that 5G appears to provoke symptoms of microwave syndrome in previously healthy people.

Keywords: Base station; 5G; Radiofrequency radiation; Electromagnetic hypersensitivity microwave syndrome; Health

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Introduction

Guidelines for exposure to Radiofrequency Radiation (RFR), also called microwaves, from ICNIRP [1] and the FCC [2] are based on outdated assumptions that ignore current scientific evidence on health effects. Tissue heating within very short exposure time is the only accepted basis for these guidelines. Thereby these guidelines do not protect against numerous non-thermal health effects observed for RFR exposure at non-thermal levels [3]. Microwaves are frequencies in the range of 300 MHz to 300 GHz and it is within this range of frequencies that modern wireless technologies for instance 3G, 4G, 5G and Wi-Fi operate. People may react to RFR with e.g., insomnia, heart palpitations, tinnitus, skin disorders, headache, and neurological symptoms at exposure levels clearly below the guidelines suggested by ICNIRP and FCC. The terms microwave syndrome, microwave illness, radiofrequency sickness or Electromagnetic Hypersensitivity (EHS) have been attributed to these health effects. The symptoms develop at levels of RFR exposure well below the guidelines from ICNIRP, and are alleviated by elimination of or reduced exposure, but may in some cases persist to some degree. Individuals suffering from EHS react with health symptoms already at very low non-thermal exposure levels to RF-radiation [4]. The symptoms of microwave syndrome or illness were described already in the 1960's by researchers in East European Countries [5] as a consequence of long-term occupational exposure to microwaves/RFR. These non-thermal effects depend primarily on the modulation and/or pulsation of the signal and also on the peak and average intensity of the RFR. The symptoms decline and may disappear completely after exposure has ceased and may after a few days to several weeks have disappeared completely [6]. Recently we published a case report on two persons, who developed the microwave syndrome after installation of base station for 5G on the roof just above their apartment [7]. Due to the severity of the symptoms caused by the sharp increase in non-thermal levels of microwaves from the 5G base station, the couple had to move to

Figure 1: Top floor apartment adjacent to base stations. Office 1 = number 1 in figure (see Table 3), Office 2 = number 2 in figure (see Table 4), office 3 = number 3 in figure (see Table 5).

another accommodation with low radiation whereby most of their symptoms quickly alleviated. This was a clear case of the microwave syndrome or illness. In this article we describe two cases with a similar medical history after installation of 5G base stations on the roof above their office. They were asked to evaluate prevalence and severity of microwave syndrome symptoms experienced at different places. The list of symptoms is adapted after Belpomme et al. [8].

Case History

Two men aged 57 and 42 years, respectively, developed symptoms typical of the microwave syndrome shortly after start of exposure to a 5G-base station that was installed and activated in November, 2021 on the roof of their office. All symptoms were self-assessed.

Man aged 57, case 1

The man is a director of a small company and an IT and management consultant like the other two men in this case study. He hired the office and used it from May 2019. At that time a base station for 3G and 4G was already at the same spot on the roof of the building where the new 5G base station was installed in November 2021. The man worked in the office below the base station without any health issues from May 2019 until November 2021. His own office room was placed right below the base station, see Figure 1, room number 1. The man spent very little time in this office during the first period after the 5G deployment, from November 2021 until end of April 2022, due to his work in other areas. However, from the end of April 2022 he worked full time in the office located below the 5G base station. He also slept overnight in the conference room within the office space next to his own office from May to the end of July 2022, see Figure 1, room no 2. In consequence, during the months of May, June and July 2022, he spent both days and nights close to the 5G base station. Within a couple of weeks, during May, he developed headache. He noticed that the headache disappeared when he left the building but reappeared when he returned.

The list of symptoms the man experienced over time during his stay in the office room and the conference room below the 5G base station is presented in Table 1. The grading of the symptoms was grade 0 (no symptoms) to 10 (unbearable pain and/or discomfort). As shown in Table 1 the most severe symptoms were headache (5), arthralgia (10), tinnitus (5), concentration and attention deficiency (7), fatigue (6), early wake-up (7), and skin burning (7). Apart from the symptoms listed in table 1 the man experienced sudden and very sharp pain in the elbows while working and living below the 5G antennas and also pain upon touching the skin with his own hand. The man left the office on August 1st, 2022. Most of his symptoms disappeared after a couple of weeks after moving to another combined office and apartment in another small town with no 5G base station antenna in proximity. All symptoms had completely disappeared by September 15th, 2022 one and a half month after he left the office. However, arthralgia and headache reappear rather quickly whenever he visits places with high radiation such as in Stockholm city [9-13]. He estimates that his sensitivity to RFR has increased after the period when he stayed in the office below the 5G base station.

Man aged 42, case 2

The man worked and slept since February 2021 in a combined office/apartment, se Figure 1, room no 3. Soon after the deployment of the 5G-base station several symptoms appeared that he did not have previously. The list of symptoms he experienced during his stay in the office are presented in Table 2. He experienced worsened insomnia (6), tendency of depression (6), anxiety/panic (7), emotivity (5), headache (3), concentration/attention deficiency (3) and to a lesser extent irritability (2), tinnitus (1), dizziness (1), balance disorder (1), confusion (1), and hair loss (1). Toothache was a major problem (not in list of symptoms). He had a history of very healthy teeth, no amalgam fillings, or any other problems. Further, the man experienced during his stay in the office a light pressure around the whole head. He describes himself as a previously very healthy person who has never had any problems with either his teeth or with headaches. The toothache, the head-pressure, and the tinnitus disappeared immediately when he left the office on December 20th, 2021. He moved to a house on the countryside with no 5G or other telecommunication masts in the near vicinity. All symptoms that he had experienced in the office disappeared rapidly. In November 2022 he declared himself completely symptom free.

Exposure to radiofrequency radiation (RFR)

All measurements of RFR exposure in the office below the 5G base station were made daytime on June 10th, 2022 with the device Safe and Sound and Pro II. It has a true response detection range between 400 MHz and 7.2 GHz. It was calibrated by the manufacturer and has an accuracy of ± 6 dB. (https://safelivingtechnologies.com/products/safe-and-sound-pro-ii-rf-meter.html). In Sweden in city

Table 1: Clinical symptoms grades 0-10. 0= no symptoms, 1= mild symptoms, 10= unbearable pain and/or discomfort. A man aged 57 years with diabetes type II.

Symptom	Office with no 5G	Office with 5G	New office without 5G
Headache	0	5	0
Dysesthesia	0	8	0
Myalgia	0	3	0
Arthralgia	0	10	0
Ear heat/otalgia	0	0	0
Tinnitus	3	5	3
Hyperacusis	0	0	0
Dizziness	0	3	3
Balance disorder	0	2	0
Concentration/Attention deficiency	0	7	0
Loss of immediate memory	0	2	0
Confusion	0	0	0
Fatigue	2	6	2
Insomnia	0	0	0
Early wake-up	0	7	0
Depression tendency	0	0	0
Suicidal ideation	0	0	0
Transitory cardiovascular abnormalities, heart rate variability	0	0	0
Ocular deficiency	0	0	0
Anxiety/Panic	0	0	0
Emotivity	N.A.	N.A.	N.A:
Irritability	N.A.	N.A.	N.A:
Global body dysthermia	0	0	0
Lungs; dyspnea, cough,	0	3	0
Stomach, diarrhea (involuntary)	0	0	0
Skin (face, arms, legs)	0	8	4
-burning, lancinating skin on hands and arms	0	8	0
Nose bleeding	0	0	0
Blood pressure variability (high, low)	N.A.	N.A.	N.A.
Hair loss	0	0	0

N.A.: Not Assessed

environments, the frequencies around 3.5 GHz and below are most commonly used for 5G, i.e., frequencies covered by the exposimeter. Nineteen measurements, each during one minute, were performed in the office room where the 57-year-old man who developed microwave syndrome symptoms worked, see no 1 in Figure 1. Further 20 measurements each during 1 minute were performed in the small apartment/office where the 42-year-old man (case 1) developed symptoms, see no 3 in Figure 1, and in the conference room where the 57-year-old man stayed overnight during three months, see no 2, Figure 1. The highest maximum radiation level, 1,180,000 μW/m^2, was measured in the office room right below the 5G base station (no 1, Figure 1) where case 1 worked, see Table 3. The roof is covered only by roofing felt which probably contributes to the very high levels right below the antennas, i.e., less shielding than sheet metal. The peak exposure values over one minute varied very much between times of measurements, which reflects the high variation of exposure to radiation from the 5G base station.

Table 2: Clinical symptoms grades 0-10. 0= no symptoms, 1= mild symptoms, 10= unbearable pain and/or discomfort. A man aged 42, previously healthy without any symptoms.

Symptom	Office with no 5G	Office with 5G	New office without 5G
Headache	0	3	0
Dysesthesia	0	0	0
Myalgia	0	0	0
Arthralgia	0	0	0
Ear heat/otalgia	0	0	0
Tinnitus	0	1	0
Hyperacusis	0	0	0
Dizziness	0	1	0
Balance disorder	0	1	0
Concentration/Attention deficiency	0	3	0
Loss of immediate memory	0	0	0
Confusion	0	1	0
Fatigue	0	3	0
Insomnia	3	6	0
Early wake-up	4	6	0
Depression tendency	0	6	0
Suicidal ideation	0	0	0
Transitory cardiovascular abnormalities, heart rate variability	0	0	0
Ocular deficiency	0	0	0
Anxiety/Panic	0	7	0
Emotivity	0	5	0
Irritability	0	2	0
Global body dysthermia	0	0	0
Lungs, dyspnea, cough	0	1	0
Stomach, diarrhea (involuntary)	0	0	0
Skin (face, arms, legs)	0	0	0
-burning, lancinating skin on hands and arms	0	0	0
Nose bleeding	0	0	0
Blood pressure variability (high, low)	0	0	0
Hair loss	0	1	0

In the conference room, see no 2 in Figure 1, where the 57-year-old man (case 1) slept for three months the highest peak maximum level measured was 501,000 μW/m^2, see Table 4. In the combined apartment/office room, see no 3 in Figure 1, where the 41-year-old man (case 2) worked and slept, highest measured peak maximum level was 613,000 μW/m^2, see Table 5. These results contrast to RFR in the new office of case 1. The radiation was low, 9 μW/m^2 to 15 μW/m^2 peak exposure, see Table 6. Also, at other places such as conference and resting rooms, and kitchen low peak RFR was measured. For case 2, lower emissions were measured in his new office/home with peak RFR from 51 μW/m^2 to 2,350 μW/m^2, see Table 7. The office was also used as bedroom. Low emissions were measured in the kitchen. Highest peak exposure was found in the living room, 2,920 μW/m^2.

Discussion

In 2020 the French government agency ANSES concluded that there were no studies on health or biological effects from microwaves

Table 3: Measurements of radiofrequency/microwave radiation in the office below the 5G base station June 10th, 2022. Office 1 in Figure 1. Each value represents maximum (peak) value during 1 minute.

Maximum value in μW/m²	Time
20,700	15:36
1,180,000	15:38
15,100	15:39
6,690	15:40
4,190	15:42
275,000	15:43
463	15:44
19,200	18:23
8,460	18:25
3,090	18:26
2,440	18:27
1,110	18:28
428,000	18:30
6,460	18:31
7,320	18:33
1,130	18:35
849	18:37
3,200	18:38
864	18:39

Table 4: Measurements of radiofrequency/microwave radiation in the office below the 5G base station June 10th, 2022. Office 2 in Figure 1. Each value represents maximum (peak) value during 1 minute.

Maximum value in μW/m²	Time
9,770	15:28
8,930	15:30
10,500	15:31
6,230	15:46
31,100	18:02
501,000	18:03
10,500	18:04
13,300	18:06
12,800	18:07
11,300	18:08
11,100	18:09
254,000	18:10
8,610	18:11
8,010	18:13
8,770	18:14
9,090	18:15
7,690	18:16
7,190	18:17
7,460	18:18
8,770	18:19

in the frequency range that is used for 5G in city areas (3.5 GHz) (https://www.anses.fr/fr/system/files/AP2019SA0006Ra.pdf). No studies on effects on human health from 5G radiation exposure have

Table 5: Measurements of radiofrequency/microwave radiation in the office below the 5G base station June 10th, 2022. Office 3 in Figure 1. Each value represents maximum (peak) value during 1 minute.

Maximum value in μW/m²	Time
13,700	15:19
17,800	15:20
17,500	15:21
19,600	15:24
91,300	15:25
27,300	18:44
38,900	18:47
25,800	18:49
19,200	18:51
19,900	18:52
154,000	19:12
490,000	19:13
613,000	19:14
19,900	19:49
22,700	19:50
17,200	19:51
25,400	19:52
20,700	19:53
18,500	19:54
23,500	19:56

Table 6: Measurements of radiofrequency/microwave radiation in the new office of case 1, Man aged 57, November 14th, 2022 at 1.30 pm to 2.30 pm. Each value represents maximum (peak) value during 1 minute.

Maximum value in μW/m²
Office
15
11
16
9
Conference room
13
8
6
5
Resting room
6
5
3
2
Kitchen
6
5
4
3

previously been published. The first rat study on effects from the 5G frequency 3.5 GHz (GSM modulated), published in October 2022,

Table 7: Measurements of radiofrequency/microwave radiation in the new office/living space of case 2, Man aged 42, November 22nd at 11.30 am and 12.30 am. Each value represents maximum (peak) value during 1 minute.

Maximum value in μW/m²
Kitchen
53
9
30
20
61
46
Living room
496
360
2,920
910
2,810
978
Bedroom/office
454
401
68
735
2,350
323
1,150
51

observed that 2 hours a day of exposure to 1,600,000 μW/m² 5 days a week during one month caused oxidative stress in the brain as well as an increase of degenerated neurons in the hippocampus region of the brain. Irisin levels were also decreased. The observed effects may trigger neurodegenerative diseases according to the authors of the study [14]. The level of exposure was non-thermal and well below the guidelines recoommended by ICNIRP [1]. Previous studies on health effects in people living near base stations and mobile phone masts have to a majority found health effects and symptom in line with the findings in this case study, also called radiofrequency sickness or microwave syndrome [15]. The effects have been observed at levels very much lower than the ICNIRP guidelines.

The presented symptoms in this case study after the deployment of 5G are typical for the microwave syndrome. They appeared after the deployment of a 5G base station on the roof right above the office and disappeared after the reduction of microwave exposure when the men left the office. The 57-year-old man's brother visited the office in May 2022 and was invited to stay overnight in the small apartment within the office space (see Figure 1, room no 3) The brother went to bed in the evening but woke up in the middle of the night with a heavy headache. He took an aspirin but the severe headache persisted. He therefore left the office space in the middle of the night and drove out of the town with his car. The headache disappeared within a couple of hours.

The headache returned when the brother again tried to stay overnight in the apartment one month later in June 2022. Also, this second time he woke up in the middle of the night with severe headache and also slight nausea. Again, he therefore left the apartment like the first time in the middle of the night and drove out to the countryside. The headache and nausea disappeared after some hours this second time as well. This case study may be regarded as a provocation study of real-life exposure to 5G.

Measurements of microwave radiation were made in the office and the living space of the men after the installation of the 5G base station on the roof. This investigation shows that the 5G base station emitted very high pulses of exposure to microwaves/RFR (maximum 1,180,000 μW/m²) and that 5G seems to be able to massively increase microwave/RFR exposure [13]. Within short time typical symptoms of the microwave syndrome are triggered, such as headache, sleep disturbances and tinnitus although the levels are well below the guidelines recommended by ICNIRP [1]. No health issues had appeared with the previous 3G and 4G equipment's at the same place. Previous measurements showed that deployment of 5G base station in addition to 3G and 4G increased microwaves/RFR peak exposure from 9,000 to 2,500,000 μW/m² [7]. Nevertheless, the guidelines for exposure to microwaves applied in most countries today are based only on thermal (heating) effects [1] that allow exposure to be as high as 10,000,000 μW/m² averaged over 30 min and 40,000,000 μW/m² local exposure averaged over 6 min [16]. The limits allow exposure to short peak exposure to be yet much higher, or 1000 × 10,000,000 μW/m². These thermal effects [17] occur at much higher intensities than those measured in the office that caused ill health effects within a short period of time.

Thus, humans are completely unprotected against all non-thermal effects of real-life exposure to microwaves/RFR from modern technology such as 3G, 4G, 5G. The harmful effects include cancer, DNA damage, oxidative stress, neurological, and other biological effects that may impair health [3]. The International Commission on the Biological Effects of Electromagnetic Fields [3] concluded that *"the assumptions underlying the FCC's and ICNIRP's exposure limits are invalid and continue to present a public health harm."* The Commission further points to the fact that 5G is being rolled out without any previous studies on health effects and that 5G creates radiation pulses from *"extremely fast data transmission rates"* that *"have the potential to generate bursts of energy"*. This case study illustrates these intense bursts of energy. The maximum peak levels varied considerably over time, see Tables 3-5.

The BioInitative Report suggested already in 2012, a limit for RFR radiation of 30 μW/m² to 60 μW/m², and even lower for sensitive persons and children, 3 μW/m² to 6 μW/m² [18] in order to protect against all known health effects based on the available evidence ten years ago. The EUROPAEM EMF guidelines proposed in 2016 maximum exposure to be 10 μW/m² to 1,000 μW/m², and lower at nighttime 1 μW/m² to 100 μW/m², and yet lower for sensitive persons 0.1 μW/m² to 10 μW/m² [19].

In addition, hundreds of scientists, medical doctors and organizations have called for a revision of the limits for better protection of humans and the environment (www.5gappeal.eu; www.emfcall.org; www.emfscientist.org). This study shows that 5G leads to very high microwave exposure with sharp peak pulses, which confirms previous measurements performed after the roll-out of 5G [13]. Several years before the roll out of 5G, scientists and medical doctors called for a moratorium on the 5G deployment due to the "*massive increase of mandatory exposure*" to microwaves and the

fact that the health hazards of this new technology had not been investigated [20], (www.5gappeal.eu). In a presentation at the ITU Workshop on 5G, EMF & Health Warsaw, December 5th, 2017, an employee of Ericsson, one of the world's leading 5G infrastructure providers, illustrated that 5G will lead to a substantial increase in RF radiation exposure [21]. If 100 times lower limits than ICNIRP's were to be used, i.e., those applied in countries such as Switzerland, 5G roll out would be a "*major problem or impossible*". Exclusion zone could be 35 meters below a base station on the roof of a building in cities.

Conclusion

5G is being rolled out without any studies showing that 5G is safe for humans and wildlife. To our knowledge, this is among the first studies of health outcomes in persons exposed to real life 5G microwave radiation. Within few weeks, a new 5G base station caused typical symptoms of the microwave syndrome or radiofrequency sickness in two men working and living in the office below the base station. The deployment of 5G also caused very high maximum (peak) microwave/RFR radiation non-thermal exposure, however far below the ICNIRP guidelines. The symptoms disappeared completely within some weeks after the men moved from the office to dwellings with much lower exposure. This case is in line with scientific findings reported over the last years on effects of exposure to microwave/RFR radiation at non-thermal levels. It also confirms previous findings that most symptoms disappear when the exposure is reduced or discontinued. This study adds to previously available studies that show that the microwave syndrome or illness appears at levels much below the current guidelines recommended by the ICNIRP.

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