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Case Study

An Eight Year Old Boy Developed Severe Headache in A School Close to A Mast with 5G Base Stations

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Abstract

The fifth generation, 5G, for wireless communication is rapidly implemented in many countries. In Sweden currently the frequency band 3.5 GHz is used. The Multiple Input Multiple Output (MIMO) technique is used, whereby the technology produces fast, repetitive, very high pulses of Radio Frequency (RF) radiation. Before the roll-out no studies have been performed on acute or chronic health effects. In recent case studies we have reported the development of the microwave syndrome in exposed previously healthy subjects including e.g. headache, dizziness, sleep problems, impaired memory and concentration, fatigue/abnormal tiredness, hormonal changes, cardiac effects, and skin changes. Mostly these effects disappeared rather rapidly when exposure to 5G RF radiation ended. In this case study we present an eight year boy who developed severe headache, but also some fatigue and dizziness at school after the implementation of 5G base stations close to the school. The RF radiation varied at the schoolyard between 83,332 and 267,536 μW/m^2 and in the classroom including corridor between 2,560 and 76,590 μW/m^2. Considerably lower levels were found in the home varying from 25 to 1,040 μW/m^2. Protective clothes had a preventive effect on his symptoms. This case study is another example of the immediate need to halt the expansion of 5G and dismantle existing base stations.

Keywords: Base station; 5G; Radiofrequency radiation; Microwave syndrome; Headache; Health; School; Children

Introduction

In Sweden, as in many other countries, there is a rapid expansion of the fifth generation, 5G, for wireless communication [1,2]. This new technology is implemented without studies that have shown the absence of health risks in either the short or long term [3,4]. No studies showing the safety of the new characteristics of RF-radiation from 5G was performed before the roll-out and is still today missing.

The Radio Frequency (RF) radiation emitted from 5G masts or 5G base stations is particularly problematic in terms of effects on human health and the environment because the technology produces fast, repetitive, very intense pulses of radiation. Biologically, this is unfavorable as the time to repair organ damage is too short. This mechanism is well known in medicine [5]. It was noted in research already in 1971 that "effects depend primarily on the instantaneous amplitude of RF radiation. Their significance increases with repeated exposure to relatively low-intensity irradiation, especially by pulsed fields, in which the total transmitted power is relatively low but the instantaneous amplitude is quite high" [6].

According to our measurements so far, 5G has led to a massive increase in RF radiation in our environment [7-13]. From studies made on previous generations of telecommunications (2G, 3G, 4G), as well as from studies on occupational exposures to RF-radiation, there is a demonstrated increased risk of neurological disorders and symptoms from pulsed modulated RF-radiation (also called microwaves) including headache, dizziness, sleep problems, impaired memory and concentration, fatigue/abnormal tiredness, hormonal changes, cardiac effects, skin changes, etc [14,15]. These are all part of the microwave syndrome or the radiofrequency sickness/illness described already during the 1960's and the 1970's. Repeated studies of people living in the vicinity of mobile phone masts or base stations for previous generations of mobile phones show an increased incidence of these symptoms [16].

In 2023, our research team was the first to study health effects among people living near 5G masts or 5G base stations. All case studies showed that 5G leads to a very high exposure to RF radiation, much higher compared to levels measured from the previous generations 2G, 3G and 4G. Our case studies also showed that 5G cause's symptoms of the microwave syndrome e.g. sleep problems, headache, dizziness, and heart problems in a short time; in several cases within 24 hours. In the first case study the symptoms became so severe within only two days that the study persons had to leave the apartment for good [7].

As a result of the 5G rollout, many persons are now exposed to levels that far exceed those previously observed to increase the incidence of microwave syndrome and cancer in the vicinity of mobile phone masts or base stations [16]. An appeal for a moratorium on the implementation of the fifth generation of wireless communications, 5G, until research on its safety has been completed has been signed by 436 scientists and medical doctors (www.5Gappeal.eu).

Case Study

In this case study we present an eight year old boy who attends a school with a mobile phone tower with 5G base stations 200 meters from the school area and 285 meters from his classroom. The school has about 520 students from pre-school to grade 6. The tower has been at the same spot for around 10 years. 5G technology has been installed at the tower since 2022, (Figure 1). The boy started at the school in

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August 2021. He is now in grade 2.

Methods

The boy's mother was asked to report his symptoms at home and at school using questions adapted after Belpomme et al. [17]. Measurements of RF radiation was performed both at the school and at the boy's home. All measurements were made 10 times, each for 1 minute. The used device was the Safe and Sound Pro II broad band RF meter. The true response detection range is 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 5G uses 3.5 GHz and is thus included in the meter's frequency range.

Results

Relatively soon after the boy began attending class at the school, he started to suffer from headache, although not every day or not even every week at first. However during the autumn of 2023, the headache has become daily and more intense at school, grade 10 on the 10-grade scale; 0 corresponds to no discomfort and 10 to unbearable discomfort. He may also experience some fatigue (grade 5), and sometimes dizziness (grade 7) at school.

The boy is symptom free in general at home but he may also occasionally have headache at home, grade 2 on the 10-grade scale, but this headache disappears relatively quickly.

Since the autumn 2023, the boy has been wearing a protective cap (which shields against RF radiation) both outdoors and also indoors in the classroom. Outdoors, he also uses a RF-protective jacket and scarf. With the protective cap, he does not suffer from headache according to experience so far.



Figure 1: Mast with 5G base stations 200 meters from the school.

Measurements of RF radiation

During the week 50, 2023 RF measurements were made both at school and at the boy's home during daytime. Table 1 shows lowest and highest results of maximum values (peak) of the ten measurements each during 1 minute. At the schoolyard the levels varied between 83,332 and 267,536 μW/m² and in the classroom including corridor between 2,560 and 76,590 μW/m². Considerably lower levels were found in the home varying from 25 to 1,040 μW/m².

Table 1: Measured levels of RF radiation at school and at home, Results are given in μW/m².

School	Min	Max
Schoolyard	83,332	267,536
Classroom (leisure, corridor)	2,560	76,590
Home		
Bedroom (pillow)	25	259
Desk	45	553
Living room (regular seat)	26	270
Kitchen table (common place)	39	1,040

Discussion

The boy's symptoms of headache, fatigue, and dizziness are commonly reported symptoms resulting from exposure to elevated RF radiation [15,16]. The levels of radiation measured at the school are significantly higher than the values at the boy's home. The severe headache only appears in the school where the RF radiation is very high both outside and in the boy's classroom. The headache appearing at home might also be a result of exposure to the higher levels at school as it has been described that symptoms might remain a while after exposure.

In the home, the radiation is much lower and the symptoms do not occur to the same extent. In addition, the symptoms do not occur when the boy is wearing a cap shielding RF radiation, according to experience so far.

This suggests that there is a causal relationship between the elevated radiation at the school and the boy's severe headache. The result is a classic example of a provocation study; symptoms (headache, fatique, dizziness) occur with 5G exposure but cease/are absent without 5G exposure.

Since more than 20 years, various scientific groups have evaluated the research and recommended limits for maximum RF radiation.

Most countries around the world have adopted ICNIRP's recommended extremely high values below which it is claimed that that there would be no health effects [18]. In the USA the FCC has adopted similar levels of maximum allowed RF radiation exposure from mobile phone base stations, including 5G [19]. These extremely high limits are based only on short term thermal (heating) effects observed within a very short time (1 hour) at intensities so high that the RF radiation heats body tissues [14].

As shown in the Table 2, ICNIRP's limits are extremely much higher than those recommended by other groups, The Bioinitiative Group [20] and the EuropaEM EMF guidelines [21]. The ICNIRP limits are neglecting all biological effects not based on tissue heating, although there is increasing evidence of a range of harmful effects at much lower levels (www.emfscientist.org). The much lower values recommended by independent research groups also take into account effects in the form of central nervous system effects such as headache, sleep problems, dizziness, etc., resulting from exposure to

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Table 2: Recommended limit exposure levels for the public by some different organizations for microwave radiation in μW/m², compared with maximum peak levels measured at the boy's school.

Year	Power Density (μW/m²)	Name	Description
1998	10,000,000	ICNIRP [31]	10,000,000 for 2-300 GHz Whole body exposure averaged over 6 min.
2020	10,000,000	ICNIRP 2020 [18]	10,000,000 for >2-300 GHz Whole body exposure averaged over 30 min.
2012	3-6	Bioinitiative 2012 Recommendation [20]	For chronic exposure to pulsed RF.[1]
2016	0,1-100	EuropaEM EMF Guidelines [21]	For extended exposure at least 4 hours a day to frequencies between GSM 900 to WiFi 5.6 GHz depending on sensitivity, night time or daytime exposure. Peak maximum values.
2023	267,536	This study	Boy's school outside; schoolyard, Boy's school inside; classroom, Peak maximum levels
	76,590		

[1]Average or peak maximum values not specified.

RF radiation at much lower levels than the very high levels required to cause heating effects.

For instance the EuropaEM EMF guidelines 2016 recommended levels of pulsed RF-radiation not to be higher than 100 μW/m² [21]. The boy is exposed at school to levels of between 76,590 (classroom) and 267,536 μW/m² (playground outdoor), clearly very much higher levels than the EuropaEM EMF guidelines. In a study on previous mobile phone generations exposures it was reported that levels exceeding 500 μW/m² caused increased risk of headache among people living near base stations [22]. There is a complete lack of studies and research showing that 5G is not harmful at the levels measured at the boy's school and in our previous case studies on 5G.

The deployment of 5G was known beforehand to increase RF-radiation exposure due to the increased and more rapid wireless data transfer and multiplication of the number of base stations. In addition to risks of the microwave syndrome, RF radiation was already in May 2011 classified as possibly carcinogenic to humans (group 2B) by the International Agency for Research on Cancer (IARC) at WHO [23]. One of the authors of this article (LH) was part of the IARC international expert review team. The IARC classification applies to all forms of RF radiation, including 5G base stations, wireless transmitters (access points often found in schools), tablets, laptops, etc.

Epidemiological studies performed to date show clear association between exposure to RF radiation and cancer [14]. In addition the largest laboratory animal studies during recent years at the National Toxicology Program [24,25] and the Ramazzini Institute [26], have confirmed the increased cancer risk. Laboratory studies have repeatedly and convincingly showed mechanisms that explain the increased risk of cancer. These include oxidative stress (known mechanism of cancer development), mRNA effects and DNA damage [27]. Consistent results on RF radiation and cancer risks have thus been found in epidemiological studies in humans, in laboratory studies in animals and in laboratory studies on cells [14,28-30].

With the increased knowledge of cancer risks, RF radiation should be classified as a human carcinogen, group 1 according to the IARC classification, if evaluated objectively without conflicts of interests. This classification should have a major impact on prevention measures.

Conclusion

Radiofrequency radiation is an environmental pollutant. The exposure to RF radiation at the boy's school, both outdoors and in his classroom, is so high that it can cause the acute symptoms in the form of headache, fatigue, and dizziness that the boy repeatedly has experienced in school but much less in the home where the RF radiation is considerably lower. In the long term there is also the possibility of increased cancer risk. It can be assumed that more children at this school and other schools with 5G antennas in close proximity also suffer from symptoms caused by the increased RF-radiation from 5G. Children are generally more sensitive than adults to harmful environmental factors. This case study underscores the urgent need for a moratorium on 5G deployment (www.emfcall.org, www.5Gappeal.eu).

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