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Evidence for a health risk by RF on humans living around mobile phone base stations: From radiofrequency sickness to cancer

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Highlights

- This study updates the knowledge on the effects of base station antennas on humans.
- Studies performed with mobile phone base stations close to apartments were selected.
- Considering all the studies reviewed globally (n=38), 73.6% (28/38) showed effects.
- The effects are radiofrequency sickness, cancer and changes in biochemical parameters.
- Similar effects from RF by different sources reinforce the conclusions of this review.

Abstract

The objective of this work was to perform a complete review of the existing scientific literature to update the knowledge on the effects of base station antennas on humans. Studies performed in real urban conditions, with mobile phone base stations situated close to apartments, were selected. Overall results of this review show three types of effects by base station antennas on the health of people: radiofrequency sickness (RS), cancer (C) and changes in biochemical parameters (CBP). Considering all the studies reviewed globally (n=38), 73.6% (28/38) showed effects: 73.9% (17/23) for radiofrequency sickness, 76.9% (10/13) for cancer and 75.0% (6/8) for changes in biochemical parameters. Furthermore, studies that did not meet the strict conditions to be included in this review provided important supplementary evidence. The existence of similar effects from studies by different sources (but with RF of similar characteristics), such as radar, radio and television antennas, wireless smart meters and laboratory studies, reinforce the conclusions of this review. Of special importance are the studies performed on animals or trees near base station antennas that cannot be aware of their proximity and to which psychosomatic effects can never be attributed.

Introduction

During the last few decades, hundreds of thousands of mobile phone base stations and other types of wireless communications antennas have been installed around the world, in cities and in nature, including protected natural areas, in addition to pre-existing antennas (television, radio broadcasting, radar, etc.). Only the aesthetic aspects or urban regulations have been generally considered in this deployment, while the biological, environmental and health impacts of the associated non-ionizing electromagnetic radiation emissions have not been assessed so far. Therefore, the effects on humans living around these anthropogenic electromagnetic field sources (antennas) have not been considered.

In France, there is a significant contribution of mobile phone base stations in the exposure to radiofrequency electromagnetic fields (RF-EMF) of urban citizens living nearby (De Giudici et al., 2021). Some studies from India indicate that more than 15% of people have levels of EMF strength above 12V/m due to their proximity to antennas (Premlal and Eldhose, 2017). Exposure estimates have shown that RF-EMF from mobile telephone systems is stronger in urban than in rural areas. For instance, in Sweden the levels of RF radiation have increased considerably in recent years, both outdoor and indoor, due to new telecommunication technologies, and the median power density measured for RF fields between 30MHz and 3GHz was 16μW/m^2 in rural areas, 270μW/m^2 in urban areas and 2400μW/m^2 in city areas (Hardell et al., 2018). Total exposure varies not only between urban and rural areas but also, depending on residential characteristics, between different floors of a building, with a tendency for building exposure to increase at higher floors (Breckenkamp et al., 2012).

Over the past five decades, and more intensively since the beginning of this century, many studies and several reviews have been published on the effects of anthropogenic electromagnetic radiation on humans living around the antennas. The first studies were carried out with radio and television antennas, investigating increases in cancer and leukaemia (Milham, 1988; Maskarinec et al., 1994;

Hocking et al., 1996; Dolk et al., 1997a, 1997b; Michelozzi et al., 1998; Altpeter et al., 2000), as well as around radars (Kolodynski and Kolodynska, 1996; Goldsmith, 1997).

Regarding base station antennas, there are scientific discrepancies in their effects: some studies concluded that there are no health-related effects (e.g. Augner and Hacker, 2009; Blettner et al., 2009; Röösli et al., 2010; Baliatsas et al., 2016) whereas others found increases in cancer and other health problems in humans living around antennas (e.g. Santini et al., 2002; Navarro et al., 2003; Bortkiewicz et al., 2004; Eger et al., 2004; Wolf and Wolf, 2004; Abdel-Rassoul et al., 2007; Khurana et al., 2010; Dode et al., 2011; Shinjyo and Shinjyo, 2014; Gandhi et al., 2015; López et al., 2021; Rodrigues et al., 2021). There is a specific symptomatology linked to radar and RF exposure at low levels, characterized by functional disturbances of the central nervous system (headache, sleep disturbance, discomfort, irritability, depression, memory loss, dizziness, fatigue, nausea, appetite loss, difficulty in concentration, dizziness, etc.), that has been termed 'RF sickness' (Lilienfeld et al., 1978; Johnson Lyakouris, 1998; Navarro et al., 2003).

The objective of this study was to perform a complete review of the existing scientific literature to update the knowledge on the effects of base stations on humans living around the antennas.

Section snippets

Methods

A search was performed in the EMF portal, Google Scholar and PubMed databases with the words: "mobile phone base station and health" or "cell tower and health".

Only studies performed in real urban conditions, with mobile phone base stations situated close to apartments, were selected. Studies conducted in larger regions with numerous antennas, based on surveys and geographic data, were also included.

On the contrary, studies were excluded that considered different sources of electromagnetic …

Results

The studies that met the selected criteria are presented in chronological order in Table 1, catalogued as Y/N depending on whether or not they found effects. The selected studies cover three types of effects: radiofrequency sickness (RS) (according to Lilienfeld et al., 1978; Johnson Lyakouris, 1998), cancer (C) and changes in biochemical parameters (CBP). Table 1 also includes the authors, year and country, antenna type, study design, diseases and symptoms found/not found and the main …

Discussion

The results of this review show three types of effects by base station antennas on the health of humans: radiofrequency sickness, cancer and changes in biochemical parameters (Fig. 1). From among all these studies, most of them found effects (73.6%). Thus, despite some limitations and differences in study design, statistical measures, risk estimates and exposure categories (Khurana et al., 2010), together they provide a consistent view of the effects on the health of people living in the …

The Precautionary Principle

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is a private organization that issues exposure guidelines that are then adopted by governments, but it has been accused of having conflicts of interest (Hardell and Carlberg, 2020; Hardell et al., 2021). The ICNIRP (2010, 2020) limits are thousands of times above the levels where effects are recorded for both extremely low frequency and RF man-made EMF and account only for thermal effects, whereas the vast majority of …

Conclusion

In the current circumstances, it seems that the scientific experts in the field are very clear about the serious problems we are facing and have expressed this through important appeals (Blank et al., 2015; Hardell and Nyberg, 2020). However, the media, the responsible organizations (World Health Organization, 2015) and the governments are not transmitting this crucial information to the population, who remain uninformed. For these reasons, the current situation will probably end in a crisis …

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. …

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> …Most of the findings in military settings are on radiation levels within the International Commission on Non-Ionizing Radiation Protection (ICNIRP) radiation standards as used by the military and industry, see ICNIRP 1998 and ICNIRP 2020. Whole-body exposure occurs also in communities near mobile base stations, as investigated by Wolf and Wolf (2004) and López et al. (2021) and the review by Balmori (2022). RFR-related tumors have also been identified in large-scale animal model studies (see, for example, Chou et al. 1992; NTP on mice, 2018; NTP on rats, 2018; Falcioni et al, 2018).…

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