

Exposure to Mobile Phone Radiation Opens New Horizons in Alzheimer's Disease Treatment

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ABSTRACT

Alzheimer's disease, the most common type of dementia and a progressive neurodegenerative disease, occurs when the nerve cells in the brain die. Although there are medications that can help delay the development of Alzheimer's disease, there is currently no cure for this disease. Exposure to ionizing and non-ionizing radiation may cause adverse health effects such as cancer. Looking at the other side of the coin, there are reports indicating stimulatory or beneficial effects after exposure to cell phone radiofrequency radiation. Mortazavi et al. have previously reported some beneficial cognitive effects such as decreased reaction time after human short-term exposure to cell phone radiation or occupational exposure to radar microwave radiation. On the other hand, some recent reports have indicated that RF radiation may have a role in protecting against cognitive impairment in Alzheimer's disease. Although the majority of these data come from animal studies that cannot be easily extrapolated to humans, it can be concluded that this memory enhancing approach may open new horizons in treatment of cognitive impairment in Alzheimer disease.

Keywords

Alzheimer, Mobile Phone, Non-Ionizing Radiation, Microwave, Radiofrequency (RF)

Introduction

While both ionizing and non-ionizing radiations have some beneficial or stimulatory effects such as induction of adaptive response [1-3], they may result in some adverse health effects. Non-ionizing radiofrequency (RF) radiation can alter cognitive functions in both humans [4, 5] and animals [6]. Mortazavi et al. have previously reported some beneficial cognitive effects after human short-term exposure to cell phone radiation. In a report published in 2011, Mortazavi et al. showed that the visual reaction time (VRT) of university students was significantly affected by a 10 min exposure to electromagnetic fields (EMF) emitted by a mobile phone [7]. They found that these exposures caused decreased reaction time which might lead to a better response to different hazards. They also revealed that occupational exposure to radar radiations decreased the reaction time in radar workers [8]. Increased brain glucose consumption after exposure to radiofrequency radiation, as confirmed by PET studies, may be a potential mechanism in this phenomenon. On the other hand, cognitive beneficial effects of long term exposure to high frequency EMF have been indicated

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by some epidemiologic studies. Using a word interference test, Arns *et al.* (2007) showed that long term heavy cell phone use resulted in better performance of normal subjects [9]. Moreover, Schuz *et al.* in 2009 reported that long-term cell phone users (subscribers of 10 years or more) had a 30–40% decreased risk of hospitalization due to AD and vascular dementia [10]. Some recent studies demonstrate that exposure to high frequency electromagnetic field improves the cognitive behavior in laboratory animals. In Alzheimer's mice, it is revealed that exposure to high frequency electromagnetic field inverts the cognitive impairment [11]. Over the past years, our laboratory has focused on studying the health effects of exposure of laboratory animals and humans to some common and/or occupational sources of electromagnetic fields such as mobile phones [1, 3, 7, 8, 12-15] and their base stations [16], mobile phone jammers [17], laptop computers [18], radars [8], dentistry cavitrons [19], and MRI [20]. This paper briefly reviews the published studies which investigated a possible association between mobile phone use and the risk of different degenerative diseases of the central nervous system (CNS).

Electromagnetic Fields and Alzheimer's Disease

The exponential rise in the use of mobile phones has raised questions regarding the biological and health consequences of exposure to radiofrequency radiations of these popular communication devices. Although recent studies show no evidence of a genotoxic effect induced by mobile phone RF radiation [21], the biological and health effects of mobile phone radiation are not fully understood [22] and some studies have indicated possible non-cancerous effects such as headaches [23] or sleep disorders [24]. Looking at the other side of the coin, there are reports indicating beneficial cognitive effects after human short-term exposure to cell phone radiation [7, 8] including reports on the role of RF radiation

in protecting against cognitive impairment in Alzheimer's disease [11].

Alzheimer's disease, the most common type of dementia and a progressive neurodegenerative disease, occurs when the nerve cells in the brain die. Although there are medications that can help delay the development of Alzheimer's disease, there is currently no cure for this disease [25]. The first evidence that long-term exposure to cell phone-generated EMFs causes cognitive beneficial effects came from a study by Arendash *et al.* in 2010 [11]. They exposed both normal mice and transgenic mice with Alzheimer's-like cognitive impairment to cell phone radiation (918 MHz, 0.25 W/kg). Their experiment showed that in Alzheimer's disease, the exposure of mice to EMFs reduced brain amyloid- β (A β) deposition through A β anti-aggregation actions.

In an attempt to apply traditional concepts from radio-communication to neuroscience, Norwegian scientists reported that modeling and analysis of exposure to radiofrequency radiation can be a potential strategy for treatment of neurodegenerative diseases [26]. On the other hand, recently Banaceur *et al.* studied the bioeffects of long-term exposure of wild type mice and triple transgenic mice (3xTg-AD) destined to develop Alzheimer's-like cognitive impairment to Wi-Fi 2.4 GHz RF radiation. Their study revealed that exposure to RF improves cognitive behavior of 3xTg-AD mice [27].

Conclusion

There are reports indicating that human long-term exposure to cell phone radiation may cause beneficial cognitive effects including protection against cognitive impairment in Alzheimer's disease. Although the majority of the studies discussed previously are performed on animal models and these animal data cannot be easily extrapolated to humans, it can be concluded that this memory enhancing approach may open new horizons in treatment of cognitive impairment in Alzheimer disease.

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Conflict of Interest

None

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