

EMFs – An Emerging Risk Factor for Cardiovascular Disease

- Increasing proportion of ST elevation MI patients lack traditional cardiac risk factors (Vernon ST, *Eur J Prev Cardiol* 2017)
- RF is an environmental pollutant with cytotoxic effects
- RF generates oxidative stress, which is implicated in CVD
- RF may contribute to CVD via oxidative cellular damage

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Invited editorial

Cardiovascular disease: Time to identify emerging environmental risk factors

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Vernon et al.¹ recently reported a significant increase in the proportion of first-time ST elevation myocardial infarction (STEMI) patients without standard modifiable cardiovascular risk factors (hypercholesterolaemia, hypertension, diabetes and smoking). While the authors correctly highlighted the need for discovering new mechanisms of coronary heart disease based on theirs and other complementing data, we would like to draw the attention of researchers in cardiovascular disease (CVD) to emerging environmental risk factors, focusing here on microwave radiofrequency electromagnetic radiation (RF-EMR).

Human exposure to RF-EMR has exponentially increased over the past three decades due to rapid and widespread deployment of wireless communication and surveillance infrastructure and the use of personal wireless devices. Public exposures have increased from extremely low natural radiofrequency levels² below 10^{-13} W/m², to above 10^{-2} W/m² now.^{3,4} RF-EMR is an environmental pollutant with cytotoxic effects.^{5,6}

Despite the European Academy for Environmental Medicine (EUROPAEM)⁷ and the American Academy of Environmental Medicine (AAEM)⁸ publishing evidence linking RF-EMR to adverse health effects and calling for exposure reduction, there is widespread ignorance about the scientific evidence of radiofrequency-induced biological/health effects within the medical fraternity. This appears to be largely due to the controversial approach by the International EMF Project at the World Health Organization (WHO),⁴ which has ignored the calls by a large group of international electromagnetic field (EMF) scientists⁹ for improved exposure regulation.

The WHO's International Agency for Research on Cancer (IARC) appointed an expert panel to examine the evidence related to cancer in 2011 which classified

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such evaluation of CVD risk has been carried out. Furthermore, there are serious shortcomings in the few panel reports that have so far evaluated biological/health effects.¹⁵

In our latest review, 242 RF-EMR studies that investigated experimental endpoints related to oxidative stress (OS)¹⁶ were identified. A staggering 216 (89%) of them found significant effects related to OS, similar to a previous review.¹⁷ These are being further analysed following presentation at the recent Australasian Radiation Protection Society conference.¹⁸ Mostly in-vivo animal studies and in-vitro studies have demonstrated increased markers of endogenous OS and/or affected antioxidant levels in different tissue/cell types upon exposure to RF-EMR. Some studies have further demonstrated amelioration of RF-induced OS upon treatment with various antioxidants. Limited human studies at this stage complement these studies demonstrating OS and/or reduced antioxidant status upon acute radiofrequency exposure under experimental settings,¹⁹ in mobile phone users²⁰ and residents near mobile phone base stations.²¹ Renowned physical scientists have recently presented experimental evidence and a theoretical explanation on how low-intensity RF-EMR can generate OS.²²

OS is known to be implicated in CVD^{23,24} and therefore RF-EMR, a new ubiquitous environmental exposure, may contribute to CVD by maintaining chronic OS, and thereby causing oxidative damage to cellular constituents and altering signal transduction pathways.

Acute RF-EMR exposure has been shown to increase blood pressure under experimental conditions,²⁵ while chronic exposure has been found to be associated with an increased CVD risk²⁶ as well as alteration in the diurnal rhythms of blood pressure

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