



The Importance of Quality Control Measures in Scientific Studies

While there are many studies that have investigated the exposure to EMF over the years, there are also many that have utilized poor techniques and design. In fact the importance of adopting quality control measures have been highlighted in a number of papers and reviews of the literature.

Relevant quality control measures for studies will depend on the type of study being performed but include¹:

1. 'Blind' collection/analysis of the data to eliminate any individual or observer 'bias';
2. Adequate description of 'dosimetry' for independent replication or confirmation;
3. Inclusion of 'positive controls' to confirm the outcomes;
4. Inclusion of 'sham-exposed controls' to compare the data with those in RF exposure conditions;
5. 'Adequate temperature controls' to ensure that cells or animals are not reacting to the ambient temperature rather than to the exposure;
6. Detailed participant selection (inclusion and exclusion criteria) and consideration of basic confounders such as age, sex and socio-demographic factors for epidemiological studies.

Dongus et. al.,² evaluated all studies that investigated biological and health effects of Wi-Fi exposure and found that out of 1385 papers only 23 fulfilled basic quality measures: 6 epidemiological papers, 6 human experimental articles, 9 in vivo articles, and 2 in vitro articles.

In a review by Vijayalaxmia and Prihodab TJ³, the authors looked at the influence of the first four measures above among 225 published animal or human cell studies from the period 1990-2017. One of the conclusions from their study was when all four quality control measures were mentioned in the publication, the differences between the exposed and control cells or the effect size, was smaller than when only one or more controls were mentioned.

A similar finding was made in the review by Karipidis' et. al.,⁴ of 107 experimental studies that investigated various bioeffects including genotoxicity, gene expression and other effects. The majority of studies were found to be using less than two of the first five possible measures with only one study using all five. The authors found that those studies with a low quality score were more likely to show a greater effect than those with a higher quality score.

In a paper by Vijayalaxmi and Foster⁵, 31 genetic damage studies involving RF exposures

¹ The first four of these measures are outlined and discussed in Vijayalaxmia and Prihodab TJ (see footnote 3 below for citation), while the fifth measure is discussed in Karipidis et al. (see footnote 4) and the sixth measure is discussed in Dongus et al. (see footnote 2).

² Dongus S. et al., Health effects of Wi-Fi radiation: a review based on systematic quality evaluation, *Critical Reviews in Environmental Science and Technology*, DOI: 10.1080/10643389.2021.1951549

³ Vijayalaxmia and Prihodab TJ, Comprehensive Review of Quality of Publications and Meta-analysis of Genetic Damage in Mammalian Cells Exposed to Non-Ionizing Radiofrequency Fields. *Radiation Research*: January 2019, Vol. 191, No. 1, pp.20-30

⁴ Karipidis K. et al., 5G mobile networks and health—a state-of-the-science review of the research into low-level RF fields above 6 GHz, *Journal of Exposure Science & Environmental Epidemiology* (2021) 31:585–605.

⁵ Vijayalaxmi and Foster KR, Improving the Quality of Radiofrequency Bioeffects Research: The Need for a Carrot and a Stick. *Radiat.*

above 6 GHz were examined for quality control measures. Despite the studies reporting statistically significant effects of exposure on different markers for genetic damage, they found “as a group (to) have significant technical weaknesses, including small size, failure to meet multiple ‘Risk of Bias’ criteria, naive use of statistics, and lack of prespecified hypotheses and methods of analysis, all of which increase the chances of false discovery.”

The conclusions from these various papers have also been mirrored in more formal reviews of the literature. Sweden’s Radiation Safety Authority’s (SSM) Scientific Council on Electromagnetic Fields, who publish annual reports on the state of EMF research has commented:

“The annual report also includes a section where studies that lack satisfactory quality have been listed. This year, as well as last year, many studies have been excluded due to poor quality. From a scientific perspective, studies of poor quality are irrelevant. They are also a waste of money, human resources and, in many cases, experimental animals.”⁶

The outcomes of the various reviews highlight the importance of the inclusion in the study design and publication of quality control measures – with the results suggesting that the more measures that are included the fewer effects are reported. While performing poor quality studies is a waste of time and effort for all concerned, the SSM has also noted in an earlier report that:

“There can also be a risk that doing bad quality studies and making people afraid may have some impact on their health and well-being and is another reason why only studies with high quality protocols should be funded, performed and published.”⁷

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⁶ Recent research on EMF and health risk, Fifteenth report from SSM’s Scientific Council on Electromagnetic Fields, 2020. Stockholm: Swedish Radiation Safety Authority (SSM), April 2021

⁷ Recent research on EMF and health risk, Twelfth report from SSM’s Scientific Council on Electromagnetic Fields, 2017. Stockholm: Swedish Radiation Safety Authority (SSM), April 2018