

Summary of Advice from Public Health England on Exposure to Radiofrequency Electromagnetic Fields

Role of Public Health England

Public Health England (PHE) came into being in April 2013, and advises the Government on all aspects of public health, including exposure to radio waves, the appropriate standards of protection for the general population and any measures necessary to protect sensitive groups. PHE inherited this responsibility from the former Health Protection Agency (HPA) and it continues to develop and provide a range of published information about radiofrequency topics. The material includes comprehensive scientific review reports and position statements, which can be found at:

<https://www.gov.uk/government/collections/electromagnetic-fields>

Within this suite of information are statements on the following frequently mentioned topics. The statements highlight assessments that have been done and which support the PHE view that exposures are small in relation to guidelines and not expected to pose a hazard to the public,

- Wireless networks (Wi-Fi), as used in schools and elsewhere
- Mobile phone base stations
- Smart meters for monitoring of domestic energy usage

The situation with mobile phones, including their use by children, is somewhat different, as explained below, but also covered by published information.

Public exposure guidelines for radiofrequency fields: scientific evidence and consistency of PHE guidance with the international consensus

Central to PHE advice is that exposures to radio waves should comply with the guidelines published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP is formally recognised by the World Health Organization (WHO). PHE has also issued precautionary advice to discourage the non-essential use of mobile phones by children. This precautionary advice recognises that exposures are much higher when mobile phones are held to the head to make voice calls than in other situations, though still within the guidelines. Similar advice is not considered necessary with the lower exposures that occur from Wi-Fi equipment, smart meters and mobile phone base stations.

While exposure to radio waves is not new and health-related research has been conducted on this topic for many years, a large amount of new scientific evidence has emerged over the past few years. This knowledge has arisen through dedicated national and international research programmes that have addressed concerns about rapidly proliferating wireless technologies. The UK has contributed to the international research effort through various projects that have been commissioned, including through the Mobile Telecommunications and Health Research Programme (MTHR). Information about the MTHR programme and the studies it supported can be found in the National Archives:

https://webarchive.nationalarchives.gov.uk/*/http://www.mthr.org.uk/

As the research programmes have been coming to fruition, scientific expert committees have been reviewing the resulting evidence and coming to considered judgments at international, European and national levels, as explained below.

Alongside other European Union (EU) member states, the United Kingdom supports European Council Recommendation 1999/519/EC on limiting exposure to electromagnetic fields (EMFs), which include radio waves. This recommendation incorporates the 1998 guidelines from ICNIRP, as advised by Public Health England. ICNIRP restated the radiofrequency (RF) parts of these guidelines in 2009 on the basis of its own comprehensive review of the scientific evidence published at that time. ICNIRP concluded that *the scientific literature published since the 1998 guidelines had provided no evidence of any adverse health effects below the basic restrictions and did not necessitate an immediate revision of its guidance on limiting exposure to RF fields*. The 2009 ICNIRP review and statement on exposure guidelines can be found at:

<http://www.icnirp.org/en/publications/article/hf-review-2009.html>

The World Health Organization states that the main conclusion from its own reviews is that *EMF exposures below the limits recommended in the ICNIRP international guidelines do not appear to have any known consequence on health*. WHO is presently preparing an Environmental Health Criteria (EHC) monograph covering the evidence in relation to radiofrequency exposures and health. This follows earlier EHCs published in 2006 on static fields and in 2007 on low frequency fields. Information from WHO about EMF exposure guidelines can be found at:

<http://www.who.int/peh-emf/standards/en/>

The European Council Recommendation 1999/519/EC invites the EU Commission to keep the scientific evidence under review. The European Commission is advised on the health aspects of EMF exposures by the Scientific Committee on Emerging and Newly Identified

Health Risks (SCENIHR). SCENIHR takes account of worldwide studies on EMFs and has produced several reports, known as Opinions, in which it expresses views broadly in line with those of PHE, ICNIRP and WHO. The most recent SCENIHR Opinion was published in March 2015 and contains detailed conclusions on different aspects of the scientific evidence. A plain language summary based on the Opinion explains that *the results of current scientific research show that there are no evident adverse health effects if exposure remains below the levels set by current standards*. SCENIHR publications can be found through the following webpage and EMF Opinions are under the "Physical Risks" category:

http://ec.europa.eu/health/scientific_committees/emerging/index_en.htm

PHE publishes comprehensive reviews of the scientific evidence relevant to radio wave exposures and health from time to time. The most recent PHE-backed review was undertaken by its own independent expert Advisory Group on Non-ionising Radiation (AGNIR) and published at the end of April 2012. AGNIR undertakes comprehensive scientific evidence reviews of the biological effects of non-ionising radiation and suggests research priorities to improve public protection. The AGNIR report considered whether there was evidence for health effects occurring in relation to exposures below the ICNIRP levels. The overall conclusion was that, *although a substantial amount of research has been conducted in this area, there is no convincing evidence that radio wave exposures below guideline levels cause health effects in either adults or children*. The AGNIR report can be found at:

<https://www.gov.uk/government/publications/radiofrequency-electromagnetic-fields-health-effects>

Exposure to radiofrequency fields and cancer

A Working Group of the International Agency for Research on Cancer (IARC) reviewed the health effects of exposure to RF fields in May 2011 and concluded that such exposures are “possibly carcinogenic” to humans (Group 2B), based on IARC’s classification scheme. As explained in the monograph itself (published in 2013) there was a minority opinion in the Working Group that that current evidence in humans was inadequate, therefore permitting no conclusion about a causal association. The monograph on RF fields can be found at:

<http://monographs.iarc.fr/ENG/Monographs/vol102/index.php>

In putting the IARC “possibly carcinogenic” classification into context, it is worthy of note that, as of September 2019, 311 substances/situations are graded 2B by IARC, 82 as the higher “probably carcinogenic to humans” classification (Group 2A) and 120 as the highest “carcinogenic to humans” classification (Group 1). Among all of these classifications are many widespread and familiar substances/situations, including those listed below:

- Group 2B: Pickled vegetables (traditional Asian), talc-based body powder (perineal use), ginkgo biloba extract, petrol engine exhaust, whole leaf extract of aloe vera, and bracken fern
- Group 2A: Consumption of red meat, shift working that involves circadian disruption, and drinking very hot beverages (>65°C)
- Group 1: Alcoholic beverages, consumption of processed meat, diesel engine exhaust, and outdoor air pollution.

The full lists can be found at:

<http://monographs.iarc.fr/ENG/Classification/index.php>

The IARC classification for radio waves was largely based on personal exposures associated with mobile phone use and the evidence was evaluated as being *limited* among users of wireless telephones for glioma and acoustic neuroma (cancers of brain/nerve tissues in the head), and *inadequate* to draw conclusions for other types of cancers. The evidence from environmental radiofrequency exposures, which include wireless telecommunications, was considered *inadequate* to draw conclusions.

Each carcinogenicity classification has to be looked at on its own merits, along with evidence relating to other health effects, in deciding on what is a proportionate public health response. IARC explains in the preamble to its monographs that their purpose is that of carcinogenic hazard identification, which is (only) the first step in performing a health risk assessment. For some exposures, it may be appropriate to do nothing, while for others it may be appropriate to seek to eliminate the exposure entirely. For radio wave exposures, the UK/PHE approach is between these two extremes and features the targeting of precautionary advice on the situation giving the highest exposure to the largest number of people, i.e. use of mobile phones held to the head in order to make voice calls. There is also a particular emphasis in that advice on those considered potentially most vulnerable, i.e. children, whose use of mobile phones should be discouraged.

HPA (now PHE) issued a response to the IARC classification when it was published and the classification has been taken into account in PHE advice. The response can be found at:

<http://webarchive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/News/Centre/NationalPressReleases/2011PressReleases/110531electromagneticfields/>

The topic of cancer effects also occupies a substantial part of the 2012 AGNIR report. The Group reviewed essentially the same evidence as the IARC working group and concluded that, although some positive findings have been reported in a few studies, overall the

evidence does not suggest that using mobile phones causes brain tumours or any other type of cancer. The data, however, are essentially restricted to periods of less than 15 years from first exposure because mobile phones have only been in widespread use for that long. AGNIR considered it will be important to continue monitoring the evidence over the coming years, including that from national brain tumour trends, which have so far given no indication of any risk.

Expert groups evaluating the overall evidence as to whether exposure to radio waves can cause cancer in humans have included the results of experiments conducted with animals as well as the results from studies involving exposed people. Subsequent to the reviews mentioned in this document, and in 2018, the US National Toxicology Program (NTP) released its final reports on rat and mouse studies that it has been conducting. NTP concluded from these studies that there was *clear evidence* of cancerous heart tumours and *some evidence* of tumours in the brain and adrenal gland of the exposed male rats. For female rats, and male and female mice, the evidence was *equivocal* as to whether cancers observed were associated with exposure to radiofrequency fields. The press release and links to the study, including the meaning of these evidence classifications, are available at:

<https://www.niehs.nih.gov/news/newsroom/releases/2018/november1/index.cfm>

However, and as NTP explains, these findings cannot be directly applied to humans. This is for two reasons: firstly, the exposure levels and durations were greater than what people may receive from mobile phones; and secondly, because the rats and mice received exposure throughout their whole bodies, which is different from the more localised exposures humans may receive, as from a mobile phone in their pocket or next to their head.

PHE considers the results from this study, though interesting, do not alter the balance of evidence in relation to human exposure when using mobile phone technologies. Overall, there is still no convincing scientific evidence that exposures from mobile phones and other radio technologies affect human health at exposure levels below internationally agreed guidelines. However, the results of this study highlight the continuing uncertainties in this complex area and reinforce the importance of following existing precautionary advice, as set out below.

Continuing PHE precautionary advice about exposure to radiofrequency technologies

PHE (as the former HPA) responded to the 2012 AGNIR report maintaining its advice to follow the ICNIRP guidelines and also maintaining the long-standing precautionary advice in respect of exposures from mobile phones, which can give rise to exposures that approach the international guidelines when they are held to the head to make voice calls. The

decision to maintain the precautionary approach reflected the continuing possibility of: (a) biological effects, although not apparently harmful, occurring at exposure levels within the ICNIRP guidelines, and (b) the limited information regarding cancer effects in the long term. Measures that mobile phone users may take to reduce their exposures were described in the HPA response to the AGNIR report

In responding to the AGNIR report for situations giving rise to exposures that are already low in relation to guidelines (for example, those from Wi-Fi, smart meters or mobile phone base stations), PHE advised that community and individual measures to reduce exposures are not necessary. PHE is also committed to carefully continue monitoring the emerging scientific evidence, providing any necessary advice and undertaking another comprehensive review of the science once sufficient evidence has accumulated. The PHE response to the AGNIR report can be found at:

<https://www.gov.uk/government/publications/radiofrequency-electromagnetic-fields-health-effects>

Electrical sensitivity/hypersensitivity

The AGNIR report has carefully assessed whether certain people are especially sensitive to exposures to RF fields, leading to unpleasant symptoms which affect their health. Many studies have now been carried out, reflecting the importance ascribed to understanding the condition and making appropriate help available to sufferers. AGNIR concludes *there is increasing evidence that RF fields below guideline levels do not cause symptoms and cannot be detected by people, even those who consider themselves sensitive to RF fields*. PHE agrees with AGNIR that this does not undermine the importance of the symptoms that are experienced, but it does suggest causes other than those directly related to RF fields should be considered.

Unfortunately, the symptoms many people complain of are all too common in society, not just in those who consider themselves to be ill. Such findings are not new, for example in 1990, before the advent of modern communications technology, 27% of people complained of having had a headache in the last month (Blaxter). HPA published a review of the public health aspects of electrical sensitivity (EHS) in 2005 and this included comments on the management of affected individuals and evaluation of treatment options. The report is available at:

<http://webarchive.nationalarchives.gov.uk/20140722091854/http://www.hpa.org.uk/Publications/Radiation/HPARPDSeriesReports/HpaRpd010/>

In terms of a practical way forward, WHO advises in its “backgrounder” document on EHS that *treatment of affected individuals should focus on the health symptoms and the clinical picture, and not on the person's perceived need for reducing or eliminating EMF in the workplace or home. EHS has no clear diagnostic criteria and there is no scientific basis to link EHS symptoms to EMF exposure. Further, EHS is not a medical diagnosis, nor is it clear that it represents a single medical problem.* For more information on WHO’s advice please follow the link below:

<http://www.who.int/peh-emf/publications/facts/fs296/en/index.html>)

Acknowledging the range of opinion about the health effects of exposure to radiofrequency fields

PHE keeps emerging scientific studies worldwide under review and supports the scientific processes and officially mandated organisations described above. It is also aware of other reports and groups that have made pronouncements on this topic but gives greater weight to documents that use rigorous review processes and base their advice on the entire range of scientific information available.

Among the alternative sources of information on this topic are the 2007 and 2012 Bioinitiative Reports. PHE is aware of the contents of these reports, and of many other reports, and has considered their contents, but it has not responded to them. In part this is because other organisations have already reviewed these reports and drawn attention to problems that have affected their conclusions.

The Council of Europe Resolution 1815 (2011) also makes various recommendations and comes from the Council of Europe’s Committee on the Environment, Agriculture and Local and Regional Affairs. It is not clear exactly what evidence was considered or which experts were approached to submit evidence to their review. The Council of Europe is separate from the European Parliament and the European Commission.

Government and PHE are aware that there are people and organisations who believe more precaution is warranted for public exposure to radio waves in light of their view of the scientific evidence. However, the published reviews by AGNIR and internationally recognised bodies do not, in the opinion of PHE, warrant more precaution than is already advised with respect to public exposure to radiofrequency fields.

PHE strategic planning priorities

PHE is the expert national public health agency which fulfils the Secretary of State for Health’s statutory duties to protect health and address health inequalities, and executes the

Secretary of State's power to promote the health and wellbeing of the nation. PHE published its strategic plan in 2019, which sets out its direction and role for the next five years to protect and improve the population's health and reduce health inequalities. The document can be found at:

<https://www.gov.uk/government/publications/phe-strategy-2020-to-2025>

PHE's strategic priorities include a smoke-free society, a healthier diet and weight, cleaner air, better mental health, the best start in life and reduced risk from antimicrobial resistance. Protection from environmental hazards, including uncertain ones like exposure to radio waves, is an important consideration for PHE, but it is also important to take a broad view across the whole range of health topics in deciding what actions are appropriate and proportionate. Unlike the hazards mentioned above and despite much research, there remains no clear evidence of harm to health from exposure to radio waves below the internationally agreed (ICNIRP) guideline levels that are already adopted in the UK.

Promotion of UK precautionary advice about exposure to radiofrequency fields

Precautionary advice for the public on radio wave exposures has been published in a leaflet from the Department of Health and Social Care on the NHS choices website, and in more technical sources such as the previously mentioned PHE response to the AGNIR report. PHE's view is that provision of this material on the internet reflects the appropriate priority of this particular topic within the broader context of all messages directed to the public about their health. Links to this material are below:

<https://www.gov.uk/government/publications/mobile-phone-base-stations-and-health>

<http://www.nhs.uk/Conditions/Mobile-phone-safety/Pages/Introduction.aspx>