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I press for safer technologies, and biologically-based EMF exposure levels.

Note: References, shown as (n) below, are hyperlinked

Executive Summary

- My evidence concerns the harmful effects of screen use (phones, tablets, laptops...etc.)
- Screens emit electromagnetic fields (EMFs)
- RF radiation and extremely low frequency magnetic fields are classified by the World Health Organisation's International Agency for Research on Cancer (IARC) as **Group 2B Possible Carcinogens**
- Light, during shiftwork, is classified as a **Group 2A Probable Carcinogen** by IARC
- The 2000 'Stewart Report', updated in 2004, advocated a 'precautionary approach' towards mobile phone use, and the Government accepted this recommendation
- The use of phones and tablets...etc. by children and young people is widespread. The 'precautionary approach' exists in name only
- Children and young people are also exposed to environmental EMFs in their homes, schools and colleges, in public places, and everywhere else, from many sources
- Our exposure levels are set by a private organisation (ICNIRP), which has known industrial and military links. The guidelines take no account of long-term exposures, or of non-heating effects
- 'SAR' (Specific Absorption Rate) is not protective
- Major peer-reviewed studies have confirmed the link between RF radiation and cancer
- The advice from UK agencies is contradictory
- The Government is facilitating the rise in 'electrosmog', through its support of 'smart' meters, 5G...etc.
- Electrosensitive individuals are ignored, and their human rights are not respected

1. Introduction

1.1

I'd like to concentrate on the harmful effects associated with screen use.

1.2

These days, a child or a young person might interact with a wide variety of screens, such as:

- TVs
- Desktop computers
- Tablet and laptop computers
- Mobile (and 'smart') phones
- DECT cordless phones
- Smart watches
- Fitness tracker devices
- Virtual reality or augmented reality headsets or glasses
- Wirelessly-connected toys and learning devices
- Wirelessly-connected media devices (to play music or films, or read e-books)
- Wirelessly-connected 'Internet of Things' devices
- Wirelessly connected 'In Home Displays' (smart meters)

1.3

There is a real risk of negative health effects arising from screen use.

2. Screens and detrimental health effects

2.1 Electromagnetic Fields (EMFs)

2.1.1

In **The Invisible Rainbow** (1), Arthur Firstenberg describes some 18th century electricity-related symptoms:

> ...Dizziness, headaches, depression, mental confusion, insomnia, muscle and joint pains, heart palpitations, ringing in the ears, nausea...

2.1.2

The link between EMFs and these common symptoms has therefore been known about for hundreds of years.

2.1.3

Screens emit EMFs of varying types, frequencies, and intensities. Even babies and infants are not spared, as electronic and wireless devices are used to monitor, placate, and stimulate them.

2.1.4

Children and young people form a lucrative target market for these devices.

2.1.5

Prolonged exposure to EMFs is linked to many serious health issues in the scientific literature.

2.1.6

Here are some of the EMFs which are emitted by these screens, together with the official classification of their carcinogenicity by the International Agency for Research on Cancer (IARC), part of the World Health Organisation:

- Extremely low frequency (ELF) electric and magnetic fields. ELF magnetic fields are a Group 2B Possible Carcinogen: There is limited evidence in humans for the carcinogenicity of extremely low frequency magnetic fields in relation to childhood leukaemia. IARC Monograph 80. (2)

- Radiofrequency/microwave (RF/MW) radiation - a Group 2B Possible Carcinogen: Positive associations have been observed between exposure to radiofrequency radiation from wireless phones and glioma, and acoustic neuroma. IARC Monograph 102. (3)

- Light, including blue light, during sleeping hours. Shiftwork - involving light during the daily dark period - is a Group 2A Probable Carcinogen: Shiftwork that involves circadian disruption is probably carcinogenic to humans. IARC Monograph 98. (4)

2.1.7

Screens may also emit or produce:

- Other electromagnetic frequencies
- 'Dirty electricity (DE)', if they are plugged into the mains. DE is essentially electrical noise, and it has been linked by epidemiologist Dr Sam Milham (5) to a number of serious health issues.

2.1.8

Children and young people are likely to be simultaneously exposed to EMFs from many sources, within their immediate environment.

2.1.9

EMFs also penetrate a building from outside.

2.1.10

Young people may be exposed to other agents concurrently with the EMFs, which can work synergistically with EMFs to produce harmful effects (6).

2.1.11

I'll now examine radiofrequency radiation, and blue light.

2.2. Radiofrequency Radiation from screens

2.2.1

In 1999, the UK Government set up the Independent Expert Group on Mobile Phones (IEGMP), under the chairmanship of Sir William Stewart, who was the Government's Chief Medical Adviser between 1990 and 1995.

2.2.2

This group reviewed the science, consulted widely, and in 2000 it published **Mobile Phones and Health** (7), known as the **Stewart Report**.

2.2.3

In 2004, the National Radiological Protection Board, again chaired by Sir William Stewart, issued an update on progress, called **Mobile Phones and Health 2004** (8). In it, the need for a precautionary approach was reiterated, and also the recommendation to limit the use of mobile phones by children.

2.2.4

Now though, use of radiation-emitting screens by children and young people is the norm. A 2017 Ofcom report (9) noted that of children aged **3-4**, 1% own a smartphone and 21% own a tablet, with the figures at 83% and 55% respectively for children aged between **12-15.**

2.2.5

It might be asked why Sir William Stewart's advice has so obviously been ignored.

2.2.6

I looked at the official advice provided by: **The Advisory Group on Non-Ionising Radiation** (AGNIR) (10), **Public Health England** (PHE) (11) and (12 *), and the **National Health Service** (NHS) (13) (14). * PHE's claim

that exposures are still within the guidelines when phones are held to the head is disputed - see 'Phonegate'

2.2.7

According to these organisations, there is no 'convincing', 'clear' or 'consistent' evidence that RF radiation can harm children or young persons, or be detected by electrosensitive people, or cause cancers or other non-cancer outcomes (including unpleasant symptoms); phones can be held to the head, wi-fi can be used in schools and elsewhere, smart meters and mobile phone masts are fine, and the RF radiation exposure levels are protective...

2.2.8

However, they also note that:

...there are possible effects on EEG patterns, the cancer evidence is not definitive, non-essential use of mobile phones by children should be discouraged, exposures are much higher when the phone is held to the head, children might be more vulnerable due to their developing body and nervous system, and they are known to be more sensitive than adults to many environmental agents.

2.2.9

People might be confused, and not know that small print warnings advise that the devices should not be held/kept against the head and the body, as these media articles (15) (16) and this website (17) illustrate. This also applies to wireless tablets and laptops (18) (19).

2.2.10

In France, Dr Marc Arazi is spearheading the 'Phonegate' (20) movement:

> Under court order, the National Frequency Agency (ANFR) of France has just disclosed that most cell phones exceed government radiation limits when tested the way they are used, next to the body...French government tests on hundreds of cell phones reveal that in 2015, 9 out of 10 phones exceed the manufacturer's reported radiation test levels when re-tested in positions where the phone is in contact with the body.

2.2.11

While the UK is drunk on wireless, France adopted an electromagnetic 'sobriety' Bill in 2015 (21), banning the exposure of children under three to Wi-Fi radiation in nurseries and public places, and restricting the exposure of older children. Also, mobile phones are to be banned from French classrooms from September 2018 (22).

2.2.12

In 2015, the U.S. City of Berkeley adopted an ordinance (23) to notify mobile phone consumers at point of sale that if they carry or use their phone in pockets or tucked into a bra when the phone is live and connected to a network, they may exceed the exposure guidelines.

2.2.13

In the UK, there is no similar advice to consumers at point of sale.

2.2.14

Professor Om Gandhi is a life fellow of the Institute of Electrical and Electronics Engineers. In **Yes the Children Are More Exposed to Radiofrequency Energy From Mobile Telephones Than Adults** (24), he says:

> Since the main reason why children, women, and people with thinner pinnae and skulls absorb more radiofrequency energy is because of the placement of the cell phone radiating source closer to the brain...it is very hard to understand why the FCC allows the use of a large SAM model of dimensions derived from the 90th percentile head size of the U.S. Military recruits for psSAR compliance testing against safety guideline.

2.2.15

SAM stands for Specific Anthropomorphic Mannequin, a plastic, fluid-filled head which is used to test SAR levels, and which is modelled on the heads of the top 10% of the US military recruits. **SAR** stands for Specific Absorption Rate, which is the amount of power absorbed per unit mass of tissue (Watt per kilogram).

2.2.16

SAR only protects against heat when using screens. Even then, the levels can be exceeded when a phone is in contact with the body, which is how people use them. How many parents and young people know this, when they hold a phone up to the head, keep a tablet in the lap, or store a phone in their pocket?

2.2.17

The UK follows the guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

2.2.18

A 2011 paper by Om P. Gandhi et al entitled **Exposure Limits: The underestimation of absorbed cell phone radiation, especially in children** (25) notes that:

> Many countries, especially European Union members, use the “guidelines” of International Commission on Non-Ionizing Radiation Protection (ICNIRP), a non governmental agency. Radiofrequency (RF) exposure to a head smaller than SAM will absorb a relatively higher SAR...The SAR for a 10-year old is up to 153% higher than the SAR for the SAM model. When electrical properties are considered, a child's head's absorption can be over two times greater, and absorption of the skull's bone marrow can be ten times greater than adults.

2.2.19

It concludes - emphasis mine:

> Because billions of young children and adults with heads smaller than SAM are now using cell phones extensively, and because they absorb proportionally greater cell phone radiation, **it is essential and urgent that governments around the world revise approaches to setting standards for cell phone radiation, to include sufficient protection of children**.

2.2.20

ICNIRP's guidelines **do not** protect against non-thermal effects, as Dr Lennart Hardell notes (26):

> The exposure guideline used by many agencies was established in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and was based only on established short-term thermal (heating) effects from RF radiation neglecting non-thermal biological effects...ICNIRP is a private organisation (NGO)

based in Germany. New expert members can only be elected by members of ICNIRP. Many of ICNIRP members have ties to the industry that is dependent on the ICNIRP guidelines. The guidelines are of huge economic and strategic importance to the military, telecom/IT and power industry.

2.2.21

In her critique (27) of the 2012 AGNIR report, Dr Sarah J. Starkey concludes:

> PHE and AGNIR had a responsibility to provide accurate information about the safety of RF fields. Unfortunately, the report suffered from an incorrect and misleading executive summary and overall conclusions, inaccurate statements, omissions and conflict of interest. Public health and the well-being of other species in the natural world cannot be protected when evidence of harm, no matter how inconvenient, is covered up.

2.2.22

Concerned parents can read Resolution 1815 of the Parliamentary Assembly of the Council of Europe (28) - emphasis mine:

> 4. ...non-ionising frequencies, whether from extremely low frequencies, power lines or **certain high frequency waves used in the fields of radar, telecommunications and mobile telephony, appear to have more or less potentially harmful, non-thermal, biological effects on plants, insects and animals as well as the human body, even when exposed to levels that are below the official threshold values**.
>
> 5. ...the precautionary principle should be applied when scientific evaluation does not allow the risk to be determined with sufficient certainty. **Given the context of growing exposure of the population, in particular that of vulnerable groups such as young people and children, there could be extremely high human and economic costs if early warnings are neglected**.
>
> 6. The Assembly regrets that...**there is still a lack of reaction to known or emerging environmental and health risks and virtually systematic delays in adopting and implementing effective preventive measures. Waiting for high levels of scientific and clinical proof before taking action to prevent well-known risks can lead to very high health and economic costs, as was the case with asbestos, leaded petrol and tobacco**.

2.2.23

The International EMF Scientist Appeal (29) is now signed by 237 EMF experts:

> Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life...
> It is our opinion that, because the ICNIRP guidelines do not cover long-term exposure and low-intensity effects, they are insufficient to protect public health.

2.2.24

People may not know that screens such as mobile phones usually communicate continuously with mobile phone masts, as well as with the WiFi router or Bluetooth devices, in order to maintain the date and time, the GPS location, and perform other app-related tasks (30) (31) (32).

2.2.25

Courts are starting to make the link between screens and cancer (33) - for example, the 2017 Italian ruling that confirmed a causal link between mobile phone use and brain tumours.

2.2.26

Also, two major studies - in the U.S. and in Italy - have recently released evidence that mobile phone and mobile mast-like RF radiation causes cancer (34) (35) (36).

2.2.27

IARC may meet to establish whether the cancer classification now needs to be tightened (37).

2.2.28

As the science on this becomes ever more difficult to dismiss, then the case for adopting a truly precautionary approach to protect children and young people becomes ever more compelling.

2.2.29

Cancer is just one serious health issue that has been linked to screens. Another is the highly contentious condition called electromagnetic hypersensitivity (EHS), also known as Electrosensitivity (ES).

2.2.30

Dr Andrew Tresidder says (38):

> ES is characterised by a variety of symptoms including one or more of tiredness and fatigue, poor quality sleep, irritability, headaches or a feeling of pressure in the head, speech and thinking disturbance, brain fog, dizziness, tinnitus, vertigo, tinglings and odd sensations in the limbs, joint pains, heart palpitations, rashes and others.
>
> Mechanisms include changes in cellular calcium influx, failure of repair of DNA breaks, blood brain barrier permeability, heat shock protein production, disruption of vital melatonin production due to blue light from screens, general sympathetic (stress) upregulation of the body and others including probably disruption of cell to cell signaling.

2.2.31

In her document **Electromagnetic Hypersensitivity - A Summary** (39), Dr Erica Mallery-Blythe adds:

> Many children are currently affected, but undiagnosed. Children are likely to be more vulnerable to developing EHS since their exposure is higher...and outcomes may be worse given their developing systems and greater time for latent effects.

2.2.32

Dr Isaac Jamieson desribes how the human rights of EHS people are ignored (40).

2.2.33

Nobody knows how many young people are electrosensitive, and there is little awareness and support. However, legal cases are now being won, and the condition is beginning to be recognised within a number of countries (41). This is positive, but there have been some tragic events .

2.2.34

In 2015, the UK media covered the case of Jenny Fry, the 15 year old school girl who was electromagnetically hypersensitive, or - as some of the papers put it - 'allergic to wi-fi' (42). Jenny was seriously affected by the wi-fi in her school, and she experienced symptoms such as 'tiredness, headaches and bladder problems caused by irritation to wireless broadband'. Her school work suffered, and she hanged herself. Her mother, Debra, believes that this may have been a last desperate call for help that went tragically wrong.

2.2.35

Now that man-made EMFs are everywhere, how many other children and young people are also 'allergic to wi-fi', and who is helping them?

2.3 Light from screens

2.3.1

In its 2010 classification of Shiftwork as a Group 2A Probable Carcinogen (4), IARC said:

> Cancer in experimental animals: There is sufficient evidence in experimental animals for the carcinogenicity of light during the daily dark period (biological night).

2.3.2

Children and young people are woken by app notifications throughout the night, interrupting sleep, and exposing them to blue light during this critical time. This may happen many times throughout the 'daily dark period', and, as Harvard Medical School (43) reports, melatonin is suppressed, and there may be a link to cancer, diabetes, heart disease, and obesity.

2.3.3

The Telegraph (44) recently published this advice (45) issued by the UK Government's Chief Medical Officer, Dame Sally Davies: Families should switch off their gadgets at night, a daily cocktail of pollution is fueling thousands of cancer, lung and heart deaths, caution is urged over the use of smartphones, and ipads, iphones and computers should be switched off at night.

3. Recommendations

3.1 The Government must:

- Recognise the severity of the problem, and act to protect people, animals, and plants
- Implement biologically-based EMF exposure levels
- Halt harmful initiatives such as 5G, and 'smart' meters
- Take advice from unconflicted experts and organisations
- Provide clear and unconflicted advice about the risks
- Recognise electrosensitivity and support sufferers
- Facilitate/fund the development of safer technologies

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