Scientific Problems and Errors of the Oregon Report on Wireless, Children and Health

The Oregon Health Authority 2020 report "Wireless technology health risks report; Senate Bill 283" would not pass peer review as it does not provide a comprehensive or systematic review of the relevant literature, has errors, omits critical research and accordingly does not comply with SB 283 (2019) which called for an investigation into the health effects of exposure to wireless radiofrequency radiation (RFR) to children, especially in the school setting, using "independently funded" peer reviewed scientific studies.

This report documents the errors, inconsistencies and scientific basis underpinning the call to retract the Oregon Health Authority (OHA) 2020 report "Wireless technology health risks report; Senate Bill 283" and the OHA website SB 283 content and OHA SB 283 Factsheet.

The children of Oregon deserve a professional high quality assessment of the hazard posed by wireless radiation.

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12. Flawed scoping resulted in omissions of important human studies in addition to animal and in vitro.
13. Ignoring animal data and in vitro (cells grown in labs for experimentation) studies in OHA's investigation of "health effects" means no conclusions can be drawn.
14. OHA Report omits research or discussion on electromagnetic sensitivity.
15. The OHA report omits research on vulnerable populations such as the elderly and medically compromised people such as people with cancer.
16. OHA omits a detailed discussion of data gaps in the scientific literature as well as the limitations of the review as it pertains to the question "Is RFR harmful."
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IV. OHA Report Scope and Content does not meet the mandate of SB 283

1. The OHA Report includes, highlights and seems to give weight to industry funded research.
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5. OHA did not make any attempts to actually measure RFR exposures in Oregon schools.
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7. The OHA conclusion that there is insufficient evidence that RFR causes cancer or other health effects is inaccurate due to the flawed design of the investigation.
8. The OHA summary is an inaccurate summary of the state of science and is a dangerous and misleading report as it creates the illusion that exposure to wireless radiation is safe...even for the most vulnerable among us, our children. The summary contradicts the conclusions of numerous published papers.

V. OHA Report has scientific errors, misrepresentations, omissions and unqualified conclusions.

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9. The January 19, 2020 OHA Website Update and Factsheet on SB 283 has unfactual debunked industry tied information and misleads the public.

VI. The OHA Report is not consistent with OHA's mission and values nor with previous methods used in OHA investigations.

1. Lack of transparency and a shroud of secrecy as to study design.
2. Animal and cell data omitted despite the fact that numerous previous OHA investigations have relied on animal and cell data.
3. OHA scientists have published research on animal data, yet animal data was not included in the health assessment.
4. The OHA Report ignores prevention considered the cornerstone of public health.

5. The OHA ignores the policies regarding the precautionary principle put forward by the American Public Health Association.
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    - Environmental justice and health inequities
    - Transparency
    - Involve affected stakeholders
    - Will the report achieve its stated health goals
    - Systematic, comprehensive data collection and analysis
    - Safeguards in place so that public health information does not harm communities nor be misinterpreted by decision makers
    - Collect relevant data
    - Ensure data validity and account for the limitations of available data
7. The implications of this report are far reaching and pose serious accountability and liability issues.
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I. Executive Summary

Scientists, public health professionals and medical experts who study the biological effects and public health impacts from radiofrequency radiation (RFR) exposure are calling for the Legislature to retract the Oregon Health Authority's Report on Wireless Radiation in Schools released to the Legislature on December 31, 2020 and to reject its determination that there is insufficient evidence to conclude that RFR exposure is harmful to children. A retraction is justified because the Oregon Health Authority (OHA) Report does not provide a comprehensive or systematic review of the relevant literature, has serious errors and accordingly does not comply with SB 283.

The report was prepared for the Oregon State Legislature by the Oregon Health Authority after Senate Bill 283 called upon the OHA to "review peer-reviewed, independently funded scientific studies of the health effects of exposure to microwave radiation, particularly exposure that results from the use of wireless network technologies in schools…"

SB 283 specifically called for "independently funded" research; however, the OHA review included and highlighted several industry funded research studies despite the fact that research shows sponsorship can impact the results when it comes to non ionizing electromagnetic radiation.

SB 283 directed focus to exposure in schools yet OHA did not review research on school setting RFR exposures nor did they attempt to characterize actual RFR exposures with actual measurement.

SB283 was specifically focused on RFR impacts to children. Yet OHA did not present research on children's unique vulnerability to wireless as documented in numerous research studies. Childrens rapidly developing brains are more sensitive to wireless radiation and children have been found to adsorb proportionately higher RFR than adults.

Best practice recommendations for systematic reviews on human health risks posed by environmental exposures were not implemented in the OHA review. OHA did not define the objectives of the evaluation nor identify the key questions to be addressed. OHA presented no scientific explanation why the scope of the research review omitted animal and in vitro studies. If the objective of the review was to determine if radiofrequency was hazardous, then the scope of the review should have included multiple evidence streams. OHA did not GRADE, rate or weigh the evidence. OHA did not conclude by classifying RFR into hazard identification conclusion categories according to key questions, but merely concluded with a summary statement.

A scientifically defensible investigation into the harmful effects of an environmental agent such as radiofrequency radiation (RFR) by a public health agency should have adhered to good practice recommendations for systematic review methodology.

This report documents fundamental flaws and deficiencies in the OHA Report which include:

- No publication or public consultation on scope and review protocols.
- The omission of animal and in-vitro research on RFR.
- The omission of reference to the classification of radiofrequency radiation as a Class 2B Carcinogen by the World Health Organization International Agency for Research on Cancer (IARC) in 2011.
- The omission of research on children's unique vulnerability to RFR.
- The omission of research characterizing school exposures to the multitude of RFR sources students are exposed to in the classroom, including Wi-Fi routers, wireless devices, cell phones and cell towers.

Three principal types of evidence are relevant to evaluating the impact of wireless radiation on children: 1) exposure modeling; 2) toxicological evaluations under controlled conditions; and 3) human studies. By excluding both modeling studies and experimental studies, the final report represents a narrow and highly skewed review of the literature. The lack of transparency and rigor in the development of the scope, flawed methodology and analysis as well as the numerous omissions and inaccuracies cast serious doubt on the validity of the review.

Previously conducted OHA public health assessments ***did*** rely upon data from animal studies, referenced U.S. National Toxicology Program studies, referenced the International Agency for Research on Cancer (IARC)/WHO reports and documented children's unique vulnerability -- all of which this OHA investigation on the health risks from children's wireless exposure rejected.

OHA's omission of laboratory animal studies is contrary to the scientific consensus on methods to identify a hazard. The world's leading public health agencies all consider animal research:

- The U.S. National Toxicology Program (NTP)
- Environmental Protection Agency (EPA)
- Food and Drug Administration (FDA)
- International Agency for the Research on Cancer of the World Health Organization (WHO/IARC)
- Center for Disease Control (CDC)

The failure of Oregon Health Authority to utilize in their review the significant body of evidence showing harm to animals from wireless radiation exposure is contrary to public health principles and OHA's own established protocols of using animal studies in their own reviews. By omitting key peer reviewed scientific evidence of adverse effects and downplaying the scientific studies showing impacts to memory and the brain, the OHA report does not comport with the Agency's mission of protecting and promoting public health.

In sharp contrast to the Oregon report, the New Hampshire State Commission on 5G Health and Environmental Effects interviewed numerous experts in a transparent process and issued a final report laying out 15 recommendations to the Governor which include reducing exposure to children in schools by replacing Wi-Fi with wired technology in schools, educating families, creating setbacks for between cell towers and schools and measuring actual RFR levels.

The children of Oregon deserve a professional high quality assessment of the hazard posed by wireless radiation. On behalf of the families of Oregon, the Oregon legislature must reject this report and direct OHA to undertake a more comprehensive scientific review that follows accepted professional best practices ***and*** that only reviews studies that are independently-funded, thereby reducing the appearance of scientific bias or undue influence by wireless industry interests.

The children of Oregon deserve a professional high quality assessment of the hazard posed by wireless radiation. The faults and omissions detailed in this report warrant an immediate retraction of the OHA Report on wireless radiation and children.

II.Overview

Senate Bill 283

In June 2019, the Oregon State Legislature passed Senate Bill 283 which called upon the Oregon Health Authority to "review peer-reviewed, independently funded scientific studies of the health effects of exposure to microwave radiation, particularly exposure that results from the use of wireless network technologies in schools or similar environments" and "The review...must, at a minimum, consist of a literature review of peer-reviewed, independently funded scientific studies that examine the health effects of exposure to microwave radiation on children."

In 2020, the Oregon Health Authority (OHA) released their report " Wireless technology health risks report " In response to the OHA Report, EHT has prepared this document to highlight the flawed design, serious errors and egregious omissions of the report. Most importantly, the OHA report does not follow scientific best practices for evaluating health risks.

Wireless as an Environmental Exposure in Schools

The Senate Bill (SB) 283 mandate directed OHA to concentrate on the review of health effects of radiofrequency radiation (RFR) with a focus on school or similar environments. OHA did not present any exposure data on how children are exposed to RFR in schools and this is one reason OHA did not adequately scope their review.

If OHA had first considered the question "How are children exposed to RFR" and "What sources create RFR exposure in the school setting" they would have documented the research described in section XXXX that children can be exposed to RFR in schools from various sources including:

- cell phones used in classrooms as both part of the educational curriculum and for personal use
- Wi-Fi networks that connect student/teacher computers to the internet as well as other wireless networks in the building
- wireless laptops, tablets and computers used by students and teachers
- virtual reality systems
- wearable tech (Bluetooth and cellular) worn by students and staff.
- Nearby cell towers. (Examples of Oregon schools with nearby cell towers include Elk Meadow Elementary School, Southern Oregon University and Stayton High School.)

All of these RFR sources -- from cell phones, to Wi-Fi laptops, to cell towers -- contribute to a child's total exposure in the classroom and on school property. Thus any investigation must include all of these exposure scenarios. Although PIAs show OHA was well aware that schools could have multiple RFR sources -- such as personal phones -- OHA did not review research on actual exposures in the final report nor did they attempt to characterize actual exposures with actual measurements.

Informational Resources
EHT has created factsheets on Wi-Fi in School that can be downloaded online at this link. Resources for parents wanting information on the health impacts of Wi-Fi and wireless can be found at this link.

The OHA investigation omits research documenting children's unique vulnerability despite the fact that PIAs show OHA scientists sharing studies on impacts to children.

PIAs show that OHA scientists shared studies on impacts to children, yet this information was not included in the report. PIAs reveal that when OHA first developed their "Action Plan Draft" for the Wireless report in April 2020 OHA shared the study "Exposure limits: the underestimation of absorbed cell phone radiation, especially in children" with several of the OHA report authors. However this well replicated research indicating children have higher wireless radiation exposures proportionate to adults was not included in the report, nor were studies showing children are more vulnerable due to their developing brains and bodies.

OHA states on Oregon Kids Healthy and Safe regarding legal chemicals, pesticides and cleaning products that, "Science has found that timing of new experiences is important, too. Children develop at different rates, but the pattern of development is similar for all. There are "windows of opportunity" when the infant is ready to learn certain things...These "windows of opportunity" are also "windows of vulnerability" as children develop. Exposure to a toxic material at a key time can lead to irreversible health problems."

"The protection of children from environmental health hazards requires the consideration of their exposure patterns and susceptibility factors when conducting risk assessments, development of child protective legislation, and wider application of the Precautionary Principle in the face of early warning of danger."
- Environmental Toxicology: Children at Risk Carroquino et al., 2014

The OHA Report should have included research on radiofrequency and impacts to vulnerable populations such as children and pregnant women.

Senate Bill 283 specifically states that the review should include scientific studies that examine "the health effects of exposure to microwave radiation on children." *However, the report has fully omitted the numerous studies that find children are more at risk from RFR studies.*

"Children are disproportionately affected by environmental exposures, including cell phone radiation," stated Thomas K. McInerny, MD, FAAP president of the American Academy of Pediatrics in a letter to the FDA and FCC.

"The average exposure from use of the same mobile phone is higher by a factor of 2 in a child's brain and higher by a factor of 10 in the bone marrow of the skull,"—The World Health Organization's International Agency for Research on Cancer's (IARC) 2011 Monograph on Radio Frequency.

On OHA's webpage "Toxic-Free Kids Act" OHA states, "Children are more vulnerable than adults to permanent injury from toxic chemicals because: They are going through critical stages of growth and development; Their bodies are smaller than adults, so by comparison their exposure level to toxins is higher." All of these issues pertain to the issue of RFR and children.

Children are more vulnerable to RFR for the following reasons:
Note: OHA omitted all the studies cited in this section and did not review research on children's proportionately higher RFR exposures compared with adults and unique vulnerability to their developing brains.

- **Proportionately deeper penetration of RFR into the brain:** Children have smaller heads than adults with shorter distances from their skull to the brain center, resulting in higher RFR absorption extending deeper into the brain compared to an adult (Morris et al., 2015, Ghandi 2015, Ferreira and de Salles 2015, Wiart et. al., 2008).
- **Thinner skulls and higher conductivity of tissues allow higher intensities of RFR into the eye and brain:** Scientific modeling finds younger brains absorb proportionally more radiation in the eyes and brain–grey matter, cerebellum and hippocampus (Fernandez et al. 2018, Christ et al., 2010, Mohammed 2017).
- **More active stem cells in their bodies:** Research shows that stem cells are more sensitive to microwave radiation, and children have more active stem cells (Belyaev 2010, Williams et al. 2006).
- **Developing brains are more vulnerable to neurotoxic exposures:** Not only do children absorb higher peak doses in the brain than adults, their brain is growing rapidly, subject to different windows of vulnerability, and thus more susceptible to adverse impacts and

environmental neurotoxicants. Exposures that take place during fetal development or early childhood may cause permanent brain injury, whereas the same doses may have little impact in adults (Heindel et al., 2015, Weiss 2000, Lanphear 2015, Redmayne and Johansson 2014 and 2015).

- **Regulations based on an adult head and body:** Government regulations were based on a 220-pound man's head, not a child's head. This is one reason why the American Academy of Pediatrics has repeatedly written to the FCC and FDA calling for more protective laws (Ghandi 2012, AAP 2012 & 2013).
- **A lifetime of exposure**: Children will receive a greater cumulative exposure than adults (Belpomme et. al, 2018, Miller et al, 2019).

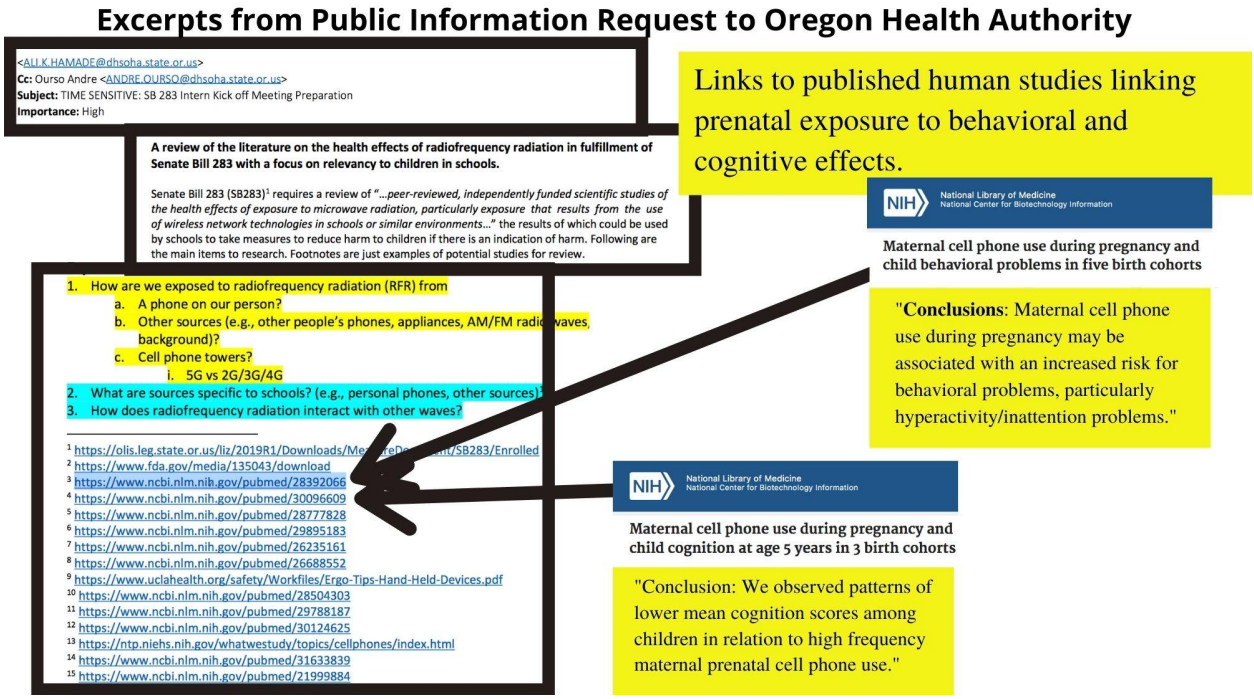
RFR exposures during pregnancy should be considered by OHA. Cabot 2014 simulated the exposure to the developing fetus at different gestational stages and found some simulations exceeded RFR limits for occupational exposure. FCC limits are based on animal studies of short term exposures from decades ago. They were not designed to protect against cancer or reproductive damage. Even if RFR exposures are compliant with FCC limits, this does not guarantee protection from health effects.

"The developing brain is more sensitive to toxins, and it is still developing until over 20 years of age. The greater absorption of RF energy per unit of time, the greater sensitivity of their brains, and their longer lifetimes with the risk to develop a brain tumor or other health effects leaves children at a higher risk than adults from mobile phone radiation,"—Lennart Hardell 2017

OHA omitted research on the vulnerability of the developing pregnancy despite OHA scientists circulating such research at the start of the review.

Although the Bill did not specify the health effects to the developing pregnancy, pregnancy is also a time of high sensitivity to electromagnetic fields. Students, teachers and staff may be pregnant and highly exposed though cell phones and devices on their laps.

In April 2020, OHA scientists circulated research that included impacts from prenatal exposure such as Birks et al. 2017 that associated maternal cell phone use during pregnancy with an increased risk for behavioral problems, particularly hyperactivity/inattention problems, in the offspring and Sudan et al. 2018 which observed maternal cell phone use during pregnancy with lower cognition scores among children. **Both these studies were absent in the final OHA Report.**



Numerous studies link exposure during pregnancy with adverse impacts in offspring. Pregnant women who used cell phones more heavily have been found to have newborns with biochemical changes to their blood and impaired fetal growth (Bektas 2018, Boileau et al., 2020). An animal study by the National Research Foundation of Korea, funded by the Korea Ministry of Education Basic Science Research Program, found RFR exposure caused a significant elevation of cortisol in the circulating blood and adrenal glands of pregnant rats.(Kim et al., 2021). The authors point out that gestational stress is widely recognized as a potential contributor to the risks of ADHD in offspring and neurobiological changes in children with ADHD appear to be similar to those associated with gestational exposure to stress.

Yale University animal studies linked prenatal cellphone radiation exposure to damaged memory and hyperactivity (Aldad et al., 2012). Replicated studies of thousands of children and pregnant women found greater behavioral problems associated with cell phone exposure (Divan et al., 2012) all of which has led Yale doctors and hundreds of health professionals to recommend that wireless radiation be reduced during pregnancy to protect the developing brain. See the BabySafe Project, PDF of Brochure.

Public Information requests reveal that OHA initially intended to include animal studies (such as the NTP that found cancer and DNA damage) and OHA was going to consider all sources of RFR in schools from Wi-Fi routers to cell phones.

Public Records Requests reveal that OHA initially intended to include animal studies (such as the NTP that found cancer and DNA damage) and was going to consider all sources of RFR in schools from Wi-Fi routers to cell phones. However, OHA did not include this in the final OHA Report on wireless.

See below screenshots of the full "action plan" first devised by OHA staff in April 2020. Importantly, much of this action plan was not implemented.

Public Information Request to Oregon Health Authority
April 2020 "Action Plan" Developed

From: Howe David M <DAVID.M.HOWE@dhsoha.state.or.us>
Sent: Friday, April 3, 2020 12:03 PM
To: Haskins Hillary K <HILLARY.K.HASKINS@dhsoha.state.or.us>; Hamade Ali K <ALI.K.HAMADE@dhsoha.state.or.us>
Cc: Ourso Andre <ANDRE.OURSO@dhsoha.state.or.us>
Subject: TIME SENSITIVE: SB 283 Intern Kick off Meeting Prepara
Importance: High

OHA asks for extension to April 2021

Hillary:

Thanks for scheduling a teleconference on Tuesday April 7th at 2:00 pm as a "kickoff" of the SB 283 study review by Interns Willie Leung and Blake Buchalter.

Per our earlier conversation, we should have a written plan outlining the process you and Ali Hamade (as project mentors) envision to complete the "review of peer-reviewed scientific studies" and creation of a summary report to the Legislature. [Note: Due to COVID, Andre and I have requested an extension of the sunset date from January 2, 2021 to April 1, 2021. Approval is pending].

Can you and Ali create an "Action Plan" Draft for Andre's review/approval (and copy me) by COB Monday? Among other things, the framework could include ideas for how to divide the review between Wille and Blake, a calendar of bench marks for completing the review and drafting the report, the means to document/track studies being reviewed, and research team status update plan (i.e. calendared weekly or semi-monthly teleconferences ?) Expansion of this idea by you and Ali is welcomed

Having a draft Action Plan would be helpful for the kickoff session. Of course, it can be refined based upon the group input at the meeting.

Thanks to you and Ali for your leadership!

David

David M. Howe, MA
RPS Section Manager

Public Information Request to Oregon Health Authority
April 2020 "Action Plan"

A review of the literature on the health effects of radiofrequency radiation in fulfillment of Senate Bill 283 with a focus on relevancy to children in schools.

Senate Bill 283 (SB283)[1] requires a review of *"...peer-reviewed, independently funded scientific studies of the health effects of exposure to microwave radiation, particularly exposure that results from the use of wireless network technologies in schools or similar environments..."* the results of which could be used by schools to take measures to reduce harm to children if there is an indication of harm. Following are the main items to research. Footnotes are just examples of potential studies for review.

Health effects

1. Epidemiology studies
   a. Cancer and tumor formation
      i. The FDA recently reviewed the evidence[2] and this might be a good place to consult after determining a search method and inclusion/exclusion criteria for studies
   b. Noncancer organ system toxicity (e.g., nervous, reproductive, skin, heart, developmental)[3][4]
   c. Anxiety, attention deficits, depression, and other mental health effects[5][6]
   d. Sleep quality[7][8]
   e. Ergonomic/physical effects (e.g., neck, hands, eyes)[9]
   f. Distracted driving and walking[10][11][12]
   g. Are there occupational health studies of RFR exposures? What did those find?
2. Animal Studies
   a. The National Toxicology Program conducted the largest study to date on animals[13] [14]
   b. Other major ones if relevant, although the focus of this review is on epidemiology studies

Exposure in context

1. How are we exposed to radiofrequency radiation (RFR) from
   a. A phone on our person?
   b. Other sources (e.g., other people's phones, appliances, AM/FM radio waves, other signals, background)?
   c. Cell phone towers?
      i. 5G vs 2G/3G/4G
2. What are sources specific to schools? (e.g., personal phones, other sources)[15]
3. How does radiofrequency radiation interact with other waves?

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[1] https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/SB283/Enrolled
[2] https://www.fda.gov/media/135043/download
[3] https://www.ncbi.nlm.nih.gov/pubmed/28392066
[4] https://www.ncbi.nlm.nih.gov/pubmed/30096609
[5] https://www.ncbi.nlm.nih.gov/pubmed/28777828
[6] https://www.ncbi.nlm.nih.gov/pubmed/29895183
[7] https://www.ncbi.nlm.nih.gov/pubmed/26235161
[8] https://www.ncbi.nlm.nih.gov/pubmed/26688552
[9] https://www.uclahealth.org/safety/Workfiles/Ergo-Tips-Hand-Held-Devices.pdf
[10] https://www.ncbi.nlm.nih.gov/pubmed/28504303
[11] https://www.ncbi.nlm.nih.gov/pubmed/29788187
[12] https://www.ncbi.nlm.nih.gov/pubmed/30124625
[13] https://ntp.niehs.nih.gov/whatwestudy/topics/cellphones/index.html
[14] https://www.ncbi.nlm.nih.gov/pubmed/31633839
[15] https://www.ncbi.nlm.nih.gov/pubmed/21999884

Oregon Health Authority 04.06.2020

OHA lists animal studies and NTP Under "Health Effects"

Yet OHA omitted all animal research in the final review.

OHA lists personal phones and cell towers as sources of RFR exposure

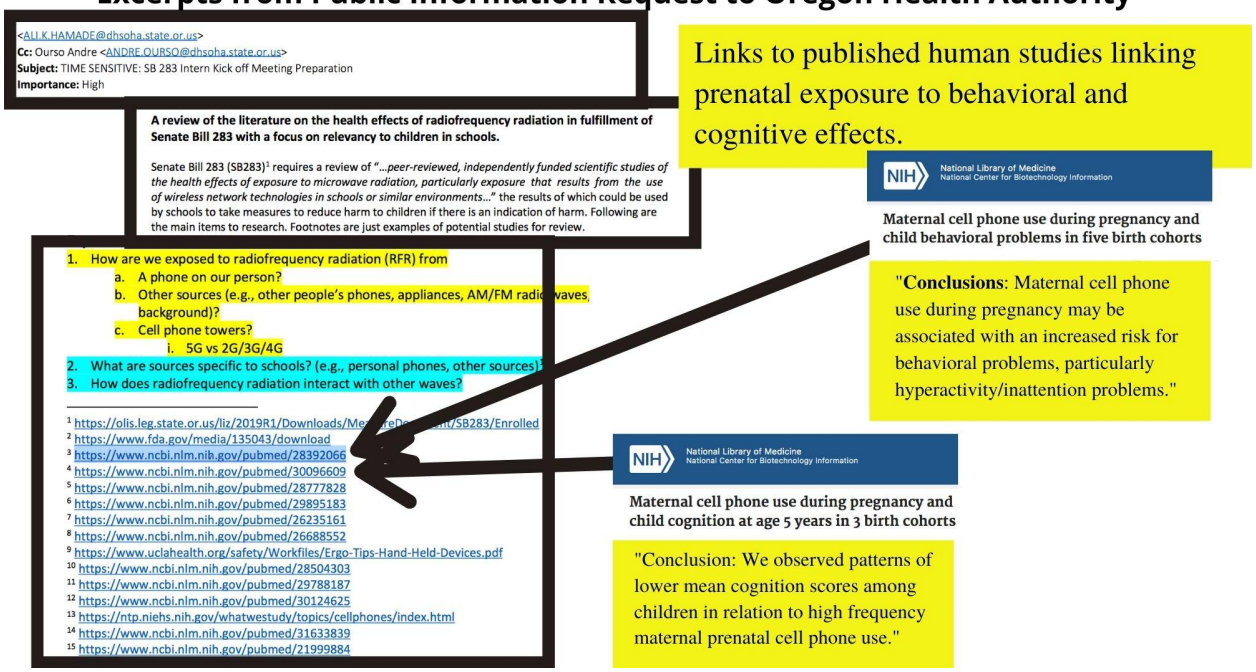
Yet OHA did not measure RFR and omitted all exposure data showing cell phone, cell towers and Wi-Fi RFR exposure.

OHA lists links of animal studies as "potential studies for review"

The studies cited by OHA include the NTP study that found DNA damage and research on how children are more vulnerable.

2021-0035 291 01/22/2021

Excerpts from Public Information Request to Oregon Health Authority



Links to published human studies linking prenatal exposure to behavioral and cognitive effects.

NIH National Library of Medicine National Center for Biotechnology Information

Maternal cell phone use during pregnancy and child behavioral problems in five birth cohorts

"**Conclusions**: Maternal cell phone use during pregnancy may be associated with an increased risk for behavioral problems, particularly hyperactivity/inattention problems."

NIH National Library of Medicine National Center for Biotechnology Information

Maternal cell phone use during pregnancy and child cognition at age 5 years in 3 birth cohorts

"Conclusion: We observed patterns of lower mean cognition scores among children in relation to high frequency maternal prenatal cell phone use."

Public Information Request to Oregon Health Authority
April 2020 "Action Plan"

i. e.g., those who wear pacemakers or other implantable devices
4. Is there enough information to estimate exposure to school children and if it exceeds benchmarks?
5. Did we notice any bias in publication?

Blake
Willie
Both as relevant to topics

Timeline
Week 1
1. Identify database(s) to be queried (e.g., Pubmed, Embase, BIOSIS)
2. Develop standard search protocol for all health endpoints
3. Set standards for study inclusion and exclusion (studies can include reviews and meta-analyses)
   a. Study strength based on design and population size (cohort size, number of cases, etc.)
   b. Study length as a factor for some endpoints (e.g., cancer and tumor formation)
   c. Is there obvious bias in the study? (funding source does not necessarily bias the study)
4. Start compiling studies

Weeks 2-3
1. Continue compilation of studies
2. Circle back and assess method success and progress with team
3. Finalize studies to be reviewed

Weeks 4-7
1. Review studies and report on progress/discuss with them
2. Compile tables that include study characteristics, outcomes, strengths, and weaknesses

Weeks 8-9
1. Draft text of findings and a synthesis of review outcomes
2. Send for team review

Weeks 10-11
1. Team reviews and comments are addressed

Agency perspectives
- National Cancer institute: https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones-fact-sheet
- The American Academy of Pediatrics: https://www.healthychildren.org/English/safety-prevention/all-around/Pages/Cell-Phone-Radiation-Childrens-Health.aspx
- The WHO: http://www.who.int/en/news-room/fact-sheets/detail/electromagnetic-fields-and-public-health-mobile-phones
- The CDC: https://www.cdc.gov/nceh/radiation/cell_phones_faq.html
- US Food and Drug Administration: https://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones/ucm116335.htm
- FCC: https://www.fcc.gov/general/cell-phones-and-specific-absorption-rate
  a. https://www.fcc.gov/consumers/guides/wireless-devices-and-health-concerns

Oregon Health Authority 04.06.2020

OHA asks if they have adequate data to estimate school exposure

Yet OHA concludes in their final report that school exposures are not linked to harmful RFR- despite the fact that they never completed a review of school exposures nor answered their own questions.

OHA lists American Academy of Pediatrics (AAP) recommendations to reduce RFR exposure.

Yet OHA omitted AAP recommendations from their final list of resources and never presents this information.

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

healthychildren.org
Powered by pediatricians. Trusted by parents.
from the American Academy of Pediatrics

Cell Phone Radiation & Children's Health: What Parents Need to Know

"If you plan to watch a movie on your device, download it first, then switch to airplane mode while you watch in order to avoid unnecessary radiation exposure."

Cancer is increasing in children in the United States

The 2020 Childhood Cancer Prevention Report shows that childhood cancer incidence rates, the number of new cases per 1,000 children, have steadily increased over the last few decades across all racial/ethnic groups. Cancer is now responsible for more than half of all childhood and teenage deaths.

According to the CDC, overall cancer incidence rates among children increased at an average of 0.8% per year during 2012 to 2016.

In 2018 the U.S. CDC presented findings of increasing brain, renal, hepatic, and thyroid cancers among individuals under 20 years old in the USA after analyzing 2001–2014 data from 48 states covering 98% of the US population. Siegel 2018

An analysis of differentiated thyroid cancer incidence among children, adolescents and young adults found increasing trends for large as well as small tumors (Vergamini et al., 2014). The significant increased rates of pediatric DTC in the U.S. are are unlikely to be entirely explained by increases in medical surveillance (Bernier 2019)

Letter From Numerous Experts to the Governor and Oregon Health Authority

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May 25, 2021

Office of the Governor
900 Court Street NE
Salem, OR 97301-4047

CC: Patrick Allen, Director OHA
Rachael Banks – Public Health Director OHA
Angela Albee – Legislative Coordinator OHA
Speaker of the House - Representative Tina Kotek
Senate President - Senator Peter Courtney
Chair House Committee on Education - Representative Margaret Doherty
Chair Senate Committee on Education - Senator Michael Dembrow

Re: Scientists and Public Health Experts Request a Retraction of the Flawed Oregon Public Health Authority Review on Wireless Radiation and Children's Health

Dear Governor Brown, Oregon Health Authority and State Legislative Leadership,

As experts in public health and bioelectromagnetics having authored more than 1000 scientific publications, we are calling for a retraction of the Oregon Health Authority (OHA) 2020 report "Wireless technology health risks report; Senate Bill 283". The report would not pass peer review as it omitted animal and cellular studies and thus it does not provide a comprehensive or systematic review of the relevant literature. Accordingly, it does not comply with SB 283 (2019) which called for an investigation into the health effects of exposure to wireless radiofrequency radiation (RFR) to children, especially in the school setting, using independently funded peer reviewed scientific studies.

Three principal types of evidence are relevant to evaluating the impact of wireless radiation on children: 1) exposure modeling; 2) toxicological evaluations under controlled conditions; and 3) human studies. By excluding both modeling studies and experimental studies, the final OHA report represents a narrow and highly skewed review of the literature. Indeed, shortcomings discussed in the OHA 2020 report are precisely why observational human studies must be complemented with experimental studies that are more tightly controlled. Further, despite SB283's stated intention to include "independently funded" studies, the final report includes and highlights industry-funded studies that have been rejected by the scientific community for their flawed methods.

The National Academy of Sciences, World Health Organization and U.S. public health agencies have a long tradition of relying on animal toxicology/carcinogenicity studies to identify hazardous agents and assess health risks in order to implement public health protective policies to prevent human harm.

Using methods that have been consistently approved and adopted by federal agencies for more than four decades, at the request of the Food and Drug Administration, the National Toxicology Program (NTP) carried out one of the largest, most comprehensive animal studies of the carcinogenicity of radiofrequency radiation. The NTP study found "clear evidence" of cancer as well as DNA damage in multiple organs. In addition, experimental studies from the distinguished Ramazzini Institute in Italy, found the same relatively rare tumor type using far lower radiation exposures, that are comparable to levels experienced from cell towers and base stations. Human epidemiology studies that examined long term exposures found associations with tumors that are of the same cell types found in the NTP and Ramazzini studies. Yale animal studies linked prenatal cellphone radiation exposure to impaired memory and hyperactivity in

offspring, adding to a growing body of published research confirming adverse impacts to behavior and brain development in the developing young brain.

The OHA report omitted research characterizing the complex RFR exposures in the school setting. Children are exposed to radiofrequency radiation in school classrooms from multiple sources including cell phones, Wi-Fi routers, wireless laptops, tablets, virtual reality systems, wearable technology and nearby cell towers. OHA took no action to gather measurement data on actual RFR exposure in Oregon schools. Nor did they gather data on the number of students, teachers and staff that have asked for accommodations through the Americans for Disabilities Act (ADA) due to experiencing the debilitating symptoms from RFR exposure in schools. OHA omitted all research on this serious emerging public health issue called electromagnetic sensitivity (EMS) that is being reported in alarming numbers by students and staff in public schools across the U.S.

This report fails to acknowledge official actions by governments in France, South Korea, Belgium, Cyprus, the European Parliament and recommendations by the American Academy of Pediatrics, California Department of Public Health, New Hampshire State 5G Commission and Maryland Commission on Children's Environmental Health that have issued specific advice about why and how to reduce children's exposures to wireless radiofrequency radiation.

As an example of the deficiencies in the report, the OHA Report "Methods" section describes the RFR emissions of interest in terms of frequencies. The report states inaccurately, "relevant RFR emissions [are] in the frequency range of cell phones and Wi-Fi, or approximately between 1.6 gigaHertz (GHz) and 30 GHz." In contrast, the International Agency for Research on Cancer of the World Health Organization examined frequencies of 30 kHz to 300 GHz in their investigation of carcinogenicity of RFR. Modern technologies use many frequencies, including RF radiation of 700 megaHertz (MHz) and lower. It is hard to have confidence in a study that misidentifies the basic parameter under investigation (albeit lower frequencies are noted among results). Indeed, the methods section did not even include the legislative directive to specifically consider "independently funded" studies, as an important criterion due to the research indicating sponsorship can impact results.

Contrary to what the OHA report asserts, OHA's conclusions are not "in line" with other US federal agencies. The Centers for Disease Control, National Cancer Institute and National Institutes of Health do not make safety determinations regarding wireless radiation and contrary to what OHA seems to imply, these agencies have not undertaken any systematic review to make such a determination. In fact, the US does not have federally developed RFR safety standards. Despite the fact that wireless devices are now commonly used by babies, toddlers and teenagers,

there has been no evaluation of the full body of scientific evidence by any US health or environmental agency for the last three decades.

The failure of Oregon Health Authority to utilize in their review the significant body of evidence showing harm to animals from wireless radiation exposure is contrary to public health principles and OHA's own established protocols of using animal studies in many other reviews. By omitting key peer reviewed scientific evidence of adverse effects and downplaying the scientific studies showing impacts to memory and the brain, the OHA review does not comport with the Agency's mission of protecting and promoting public health.

Best practice recommendations for systematic reviews on human health risks posed by environmental exposures were not implemented in the OHA review. OHA did not define the objectives of the evaluation nor identify the key questions to be addressed. If the objective of the review was to determine if radiofrequency was hazardous, then the scope of the review should have included multiple evidence streams. OHA presented no scientific explanation why the scope of the research review omitted animal studies and *in vitro* studies. OHA did not GRADE, rate or weigh the evidence. OHA did not conclude by classifying RFR into hazard identification conclusion categories according to key questions, but merely concluded with a summary statement.

A scientifically defensible investigation into the harmful effects of an environmental agent such as radiofrequency radiation (RFR) by a public health agency should have included the following:

- Adherence to good practice recommendations for systematic review methodology, including the publication and consultation of scope and review protocols.
- Inclusion of animal and *in-vitro* research on RFR, according to key questions under review.
- Reference to the classification of radiofrequency radiation as a Class 2B Carcinogen by the World Health Organization International Agency for Research on Cancer (IARC) in 2011 and the 2019 WHO advisory group recommendations that RFR associated with wireless technology be re-evaluated due to the recent animal and human studies finding associations with cancer.
- Research on children's unique vulnerability to RFR due to their relative size, proportionately higher brain exposures and developing brains.
- The inclusion of recent research such as studies associating RFR with breast cancer and thyroid cancer.
- Research characterizing school exposures to the multitude of RFR sources students are exposed to in the classroom, including Wi-Fi routers, wireless devices, cell phones and cell towers.

Environmental Health Trust has documented these shortcomings as well as numerous additional issues and inaccuracies in an attached report also online here.

The lack of transparency and rigor in the development of the scope, flawed methodology and analysis as well as the numerous omissions and inaccuracies cast serious doubt on the validity of the review. These faults and omissions, in our view, warrant the retraction of the report.

Respectfully,

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Letter From Environmental Working Group to the Oregon Health Authority

The Environmental Working Group (EWG) also submitted comments to Oregon Health Authority, calling on the OHA to revise its report "Wireless Technology Health Risks" by including the latest findings from human and animal studies that demonstrate the risks of radiofrequency radiation for children's health.

Excerps from the letter by Environmental Working Group"

"Given the substantial scientific evidence demonstrating that RFR exposure can negatively affect the brain and the heart, EWG is calling for the Oregon Health Authority, or OHA, to revise its report "Wireless Technology Health Risks" by including the latest findings from human and animal studies that demonstrate the risks of RFR for children's health and public health generally. The OHA report, released in December 2020, did not provide a comprehensive review of relevant RFR literature and should be corrected."

The findings from the NTP and Ramazzini studies agree with evidence from epidemiological studies, which reported an increased risk of gliomas and acoustic neuromas among long-term cell

phone users (5, 6). These epidemiological findings were the basis for the IARC classification of RFR as a possible carcinogen (7).

In addition to the NTP and the Ramazzini Institute reports, other toxicological and in vitro studies provide evidence of carcinogenic, genotoxic, reproductive, developmental, and neurological effects of RFR exposures. In vitro and toxicological studies also point out potential mechanisms of RFR-mediated impacts, which include changes in the function of calcium channels (8-10), levels of reactive oxygen species (10-15), intracellular enzymes, gene expression (16) and membrane permeability (17), and interference with DNA repair processes (18). The findings of these mechanistic studies substantiate the capacity of RFR to elicit biological effects.

"Existing evidence indicates that children absorb more RFR and are more susceptible to the adverse effects of RFR than adults. With multiple sources of radiofrequency radiation, including Wi-Fi networks, wireless devices, cell phones and cell towers, protecting children's health from avoidable RFR exposures should be a priority. Hence the conclusion drawn from a systemic review should account for the possible cumulative risk of adverse effects associated with exposures to multiple RFR sources."

"It is important for the OHA report to recognize that there are guidelines from several agencies, including the California Department of Public Health, American Academy of Pediatrics, New Hampshire State 5G Commission and Maryland Commission on Children's Environmental Health about how children could be protected from the adverse effects of RFR exposures. These recommendations are based on extensive research showing how children are more susceptible than adults to toxic chemicals and other exposures that affect human health. There are also studies showing combined adverse effects resulting from simultaneous exposures to chemical contaminants and RFR (19, 20). References to the reports cited here should be included in the revised OHA report."

The OHA report failed to include some important findings on the adverse impacts of RFR exposures in a school setting, such as the study by Meo et al. (21), which found that RFR exposures from cell towers adjacent to school buildings was associated with delayed development of fine and gross motor skills, spatial working memory and attention."

"In conclusion, EWG urges the OHA Oregon Health Authority to conduct a more comprehensive evaluation of RFR research and update its report to reflect the evidence of adverse effects associated with RFR exposures."

The link to the EWG scientific letter is found at
https://cdn3.ewg.org/sites/default/files/testimony/EWG_Letter_Oregon_Health_Authority.pdf?_ga=2.246574660.1129706034.1611498153-1356428308.1597363105

III. OHA Report Does Not Follow Good Practice Recommendations for Systematic Review

The OHA did not follow best practices for systematic reviews on human health risks posed by environmental exposures.

In health care, detailed methodologies with descriptions of strengths and discussions of nuances of scientific review steps have been developed by the International Cochrane Collaboration, and the US Agency for Health Research Quality (AHRQ), using methods that are summarized on the Preferred Reporting Items for Systematic Reviews and meta-Analyses (PRISMA) website (Moher et al, 2009, Liberati et al., 2009).

Good practice recommendations for systematic review for environmental health exposures have been developed and published (Whaley et al., 2016, Whaley et al., 2020, Rooney et al., 2014, NAS, 2017, Stephens et al., 2016).

OHA's report is not in line with numerous critical practical recommendations.

Here is a list of deficiencies:

1. There was no publication nor public consultation on the scope and review protocol. The scoping of the review is a core problem with the report and has led to most of the issues discussed in our review.
2. OHA does not provide any scientific explanation nor justify the decision to only consider limited human studies in their report.
3. Animal data is an important and highly relevant line of evidence in systematic reviews of environmental effects on human health. A 2017 publication of the National Academy of Sciences on systematic review documents the importance of both animal and human data, stating, "A determination of whether an effect is adverse requires expert judgment and should be based on evaluation of the effect in both the animal and human literature."

4. OHA did not grade or weigh the evidence, rate the level of confidence or translate that level into levels of evidence for health effects.
5. OHA did not classify RFR into one of five hazard identification conclusion categories: Known to be a hazard to humans, Presumed to be a hazard to humans, Suspected to be a hazard to humans, Not classifiable as a hazard to humans, Not identified to be a hazard to humans.
6. Studies which were excluded after assessment of full text should have been listed in a table of excluded studies along with the reason for their exclusion.

OHA's search terms are not consistent with the exposure investigated.

Page 8 begins OHA's presentation of the search terms used in the review. They used Wi-Fi, wlan, mobile phones, mobile, phones, cell phones, cell, phones and cancer with the dates 1993/01/01 to 2020/04/24. **They did not use the word radiofrequency -- the agent in question.** A report can be no stronger than the bibliographic search, and this is itself an area of expertise. This expertise is not noted among review authors, and there was no review or validation of the search strategy.

Why didn't OHA use "radiofrequency", LTE, and "wireless" in the search terms as many studies on this issue have used this terminology? To omit the search term "radio frequency" for a report of research on radiofrequency is not logical. Numerous studies designed to test the biological effects of RFR use the term radiofrequency or sometimes simply state the frequency of the electromagnetic field.

Why were the words "toxicity" and "health effects" used rather than specific endpoints such as oxidative stress, endocrine, DNA damage, sperm damage, etc?

These issues might explain why numerous studies on critical endpoints were omitted.

The respected journal Lancet Planetary Health published Bandara and Carpenter 2018 that states:

> "A recent evaluation of 2,266 studies (including in-vitro and in-vivo studies in human, animal, and plant experimental systems and population studies) found that most studies (n=1546, 68·2%) have demonstrated significant biological or health effects associated with exposure to anthropogenic electromagnetic fields. We have published our preliminary data on radiofrequency electromagnetic radiation, which shows that 89% (216 of 242) of experimental studies that investigated oxidative stress endpoints showed significant effects. This weight of scientific evidence refutes the prominent claim that the deployment of wireless technologies poses no health risks at the currently permitted non-thermal radiofrequency exposure levels."

As an example of how the OHA report's search terms hindered the ability for the report to capture relevant studies is the absence of updated/recent publications. In 2020, Henry Lai PhD updated his reports on published studies finding effects from RFR and non ionizing radiation and has posted this analysis as well as all the abstracts on the Bioinitiative Report:

- Neurological RFR studies report effects in 73 % of studies on RF radiation -- or 244 of 336 studies. (Bioinitiative 2020).
- Genetic effect studies report effects in 65 % of studies on RF radiation -- or 224 of 346 studies (Bioinitiative 2020).
- Free Radical (Oxidative Damage) effect studies report effects in 91 % of studies on RF radiation -- or 240 of 261 studies (Bioinitiative 2020).
- RFR Comet Assay effect studies report effects in 65 % of studies on RF radiation -- or 78 of 125 studies (Bioinitiative 2020).

Animal studies were omitted in the report.

The report does not include any animal studies, most notably the $30 million U.S. National Toxicology Program Animal Study that found statistically significant increases in DNA damage, heart damage, malignant glioma tumors of the brain and malignant schwannomas of the heart as well as other tumor increases.

For more than four decades of inter-agency consultation with the Food and Drug Administration and other agencies, regulatory authorities have relied on controlled experimental studies based upon laboratory animals carried out by the U. S. National Toxicology Program (NTP), using well-established protocols to evaluate risks to humans.

There are numerous additional published animal studies that provide scientific evidence of harmful biological effects such as (click on link to go to publication) damage to ovaries, uterine oxidative stress, tumor promotion, hepatic injury, DNA fragmentation, alteration of gene expression, altered hematological profiles, increased stress and anxiety, impaired hippocampal learning and spatial memory,cognitive impairment and hippocampal tissue damage, oxidative stress of brain and liver, altered testes development, changes to microRNA expression in brain tissue, cognitive impairment, changes in the morphology and expression of heat shock proteins and glucocorticoid receptors in thymus, heart variability and changes to blood pressure, impacts to growth and pubertal development, impaired spatial memory, apoptosis, DNA oxidation, nitrosative stress, altered melatonin, deoxyribonucleic acid damage, oxidative stress in the kidney, abnormal pregnancy, impacts to cornea, immunohistopathologic effects, thyroid chemistry, thyroid hormones, altered circadian organization, single strand DNA breaks,

mutagenic brain responses, blood-brain barrier damage, demyelination in cortical neurons and more.

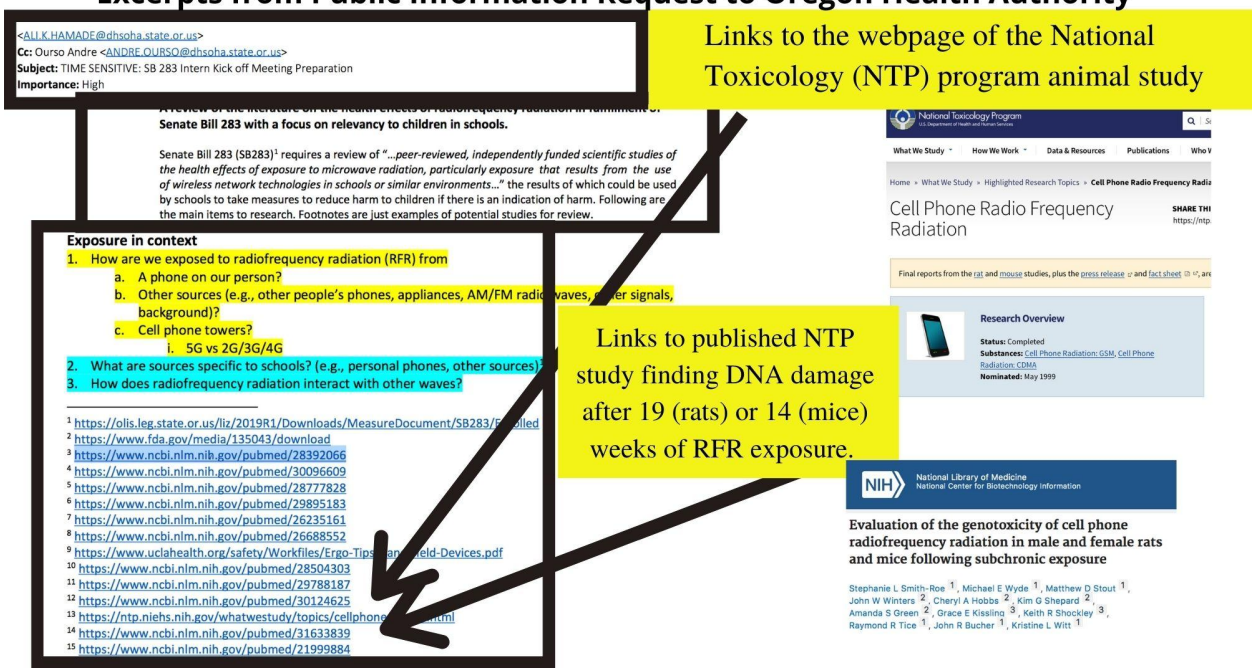
Yet, all animal research was omitted in the OHA report. OHA is insisting on proof of human harm before taking steps to prevent damage to children's health.

The National Toxicology Program (NTP) animal study was omitted from the final OHA Report despite the fact that PIAs show OHA report authors/reviewers sharing the NTP study with each other.

PIAs show that OHA circulated the National Toxicology Program (NTP) animal study on radiofrequency radiation (as well as the published NTP results specifically showing DNA damage from radiofrequency) when they first developed their SB 283 "Action Plan". However, the NTP study was not included in the final report and the NTP was not even listed as a resource for more information on the OHA website section called Additional Resources.

Here is a screenshot of an email sent during deliberations on the SB 283 Action Plan that shows the NTP study website (https://ntp.niehs.nih.gov/whatwestudy/topics/cellphones/index.html) as well as the study "Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure" (https://pubmed.ncbi.nlm.nih.gov/31633839/) listed as research that OHA states in the email as "examples of potential studies for review."

Excerpts from Public Information Request to Oregon Health Authority



Remarkably, the final Oregon Report fails to consider the NTP final reports on their $30 million animal study on long-term exposure to wireless radiofrequency (RFR) radiation that found statistically significant increases in DNA damage, heart damage, malignant glioma tumors of the brain and malignant schwannomas of the heart. The increased incidence of heart tumors (malignant schwannomas) in the NTP was considered by the expert peer-reviewers and staff of the NTP to demonstrate "clear evidence of carcinogenic activity" from RFR.

Another large-scale animal study on RFR by the Ramazzini Institute in Italy of RF-EMF which used much lower exposure levels (Falcioni, 2018) replicated the findings of the NTP study, finding increases in the same tumors observed in the NTP study.

"Overall, the National Toxicology Program findings demonstrate the potential for RFR to cause cancer in humans."—Dr. Linda Birnbam, former Director of National Institutes of Health and Director of the National Toxicology Program in 8/2020 EHT et al v. FCC Amicus Brief on the NTP cell phone radiation studies.

Although OHA did not include the NTP as a resource on the OHA website section called Additional Resources, OHA did later post information on the NTP in a downloadable OHA SB 283 Factsheet. However, the summary of the study omits findings of DNA damage in tissues of mice and rats, omits the finding of cardiomyopathy, and

NTP Results of DNA damage after 14 weeks of RFR exposure were fully omitted despite being circulated by OHA staff in the beginning.

PIAs show that OHA circulated the NTP study that found DNA damage after 19 (rats) or 14 (mice) weeks of exposure to radiofrequency radiation when they first developed their SB 283 "Action Plan".

However this NTP study was not included in the final report and these findings were not presented in the SB 283 FAQS, nor anywhere in the OHA materials on wireless radiation. Why not?

The NTP published study "Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure" (https://pubmed.ncbi.nlm.nih.gov/31633839/) was listed as research that OHA states in the PIA emails as "examples of potential studies for review."

This study found that after 19 (rats) or 14 (mice) weeks of RFR exposure, animals were examined and results of the comet assay showed significant increases in DNA damage in the frontal cortex of male mice (both modulations), leukocytes of female mice (CDMA only), and hippocampus of male rats (CDMA only). "In conclusion, these results suggest that exposure to RFR is associated with an increase in DNA damage."

OHA's omission of animal data is contrary to the scientific consensus on methods to identify a human health hazard.

Causation is relatively easy to study in the laboratory, but very difficult if not impossible to prove epidemiologically. The following health agencies use animal data *in addition to human data* to investigate potential health effects for humans:

- **The National Toxicology Program (NTP)**
  NTP prepares the Report on Carcinogens on behalf of the US Secretary of Health and Human Services and follows an established, multi-step process for the review and evaluation of selected substances. Human and animal data are considered in their evaluation.
- **Environmental Protection Agency (EPA)**
  The EPA Guidelines for Carcinogen Risk and Review of EPA's Integrated Risk Information System Process utilizes animal data.
- **Food and Drug Administration (FDA)**

The FDA uses animal data to evaluate if drugs and food are toxic as detailed in the Carcinogenicity Studies with Rodents.

- **International Agency for the Research on Cancer of the World Health Organization (WHO/IARC)**
  The WHO/IARC evaluations of toxic substances always include animal data in their evaluations of agents. In fact, the reason the WHO/IARC 2011 classification of RFR was "possible" rather than "probable" was because of the need for stronger animal data.
- **The Agency for Toxic Substances and Disease Registry (ATSDR)**
  ATSDR is a federal public health agency whose mission is to serve the public by using the best science, taking responsive public health actions and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR states, "Whether the data are from animal studies or based on human exposures. Sometimes, information about the health effects in humans may not be complete. In these cases, scientists at ATSDR may use animal studies when the health effects in animals may be similar to the health effects in humans."
- **Center for Disease Control (CDC)**
  The CDC incorporates animal data as exemplified in their document The Fetal Alcohol Spectrum Disorders Competency-Based Curriculum Development Guide for Medical and Allied Health Education and Practice developed by the CDC and other expert organizations.
- **National Institute of Environmental Health Sciences Office of Health Assessment and Translation (NIEHS/OHAT)**
  NIEHS/OHAT developed a Handbook for Conducting a Literature-Based Health Assessment Using OHAT Approach for Systematic Review and Evidence Integration that integrates health-outcome data from human, animal and mechanistic studies to reach hazard identification conclusions.

OHA Report Omits the Monograph of the International Agency for Research on Cancer of the World Health Organization Classifying RFR as a Class 2B Carcinogen.

On May 2011, the International Agency for Research on Cancer (IARC), the specialized cancer agency of the World Health Organization, classified radiofrequency radiation (RFR) as "possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use." A working group of 31 scientists from 14 nations made this determination after reviewing hundreds of studies that examined the potential carcinogenic hazard of long-term exposure to RFR. They examined exposure data, studies of cancer in humans, studies of cancer in experimental animals and mechanistic and other relevant data.

The IARC/WHO stated that the classification includes ALL forms of wireless radiofrequency radiation including cell towers, cell phones and Wi-Fi.

It is very concerning that the OHA Report omitted this crucial public health determination by the World Health Organization that exposure may be possibly carcinogenic to humans! This omission alone is grounds to dismiss the entire Report as an inadequate and misleading overview of the research.

The published review "Health effects of electromagnetic fields on children" states, "the fact that EMFs are possibly carcinogenic according to the IARC should not be overlooked and recommends children's exposure to EMFs be minimized.

- Read the IARC/WHO Monograph.
- Read the 2011 IARC/WHO Press Release.
- Read the Lancet publication by IARC/WHO on the Carcinogenicity of Radiofrequency.

Since 2011, numerous expert scientists who participated in the IARC/WHO EMF working group and research review have publicly stated that the scientific evidence has increased and that the carcinogenic classification should now be upgraded to a higher level of confidence.

In turn, due to the growing body of scientific evidence over the past decade documenting biological harm from RFR, the WHO/IARC advisory committee released a report last year recommending wireless radiation be re-evaluated by 2024 as a "high priority," specifically citing new research studies by Hardell and Carlberg 2017, Coureau et al., 2014, NTP 2018, Lerchl 2015 and Falcioni et al.2018 which found associations between RFR exposure and cancer.

Cellular studies -- In-vitro evidence streams -- were omitted.

In-vitro studies of tissues and cells provide information on how cells react to environmental stressors. When investigating health effects of an agent, scientists evaluate human studies, animal studies and cellular studies. Yet the OHA review omitted this entire body of research.

The European Union funded study REFLEX was designed to investigate the basic mechanisms in cellular and sub-cellular systems that are possibly triggered by exposure to electromagnetic radiation and concluded that low frequency as well as radiofrequency electromagnetic fields below the allowed exposure limits displayed gene-damaging potential (REFLEX final reports).

Studies have demonstrated that RFR can impact human primary fibroblasts, and that stem cells are most sensitive to microwave exposure (Markova et al., 2010). As stem cells are more active

in children than in adults, researchers posit that these studies may clarify the possible cancer risks to children. RFR has been found to inhibit formation of endogenous 53BP1/γ-H2AX foci (Belyaev et al. 2005, 2009; Markovà et al. 2005). RFR has been found to alter protein expression in a human endothelial cell line.

A pilot human volunteer study found a local exposure of human skin to RF-EMF caused changes in protein expression in living people. Researchers have hypothesized that "mobile phone radiation-induced activation of hsp27 may: (i) facilitate the development of brain cancer by inhibiting the cytochrome c/caspase-3 apoptotic pathway; and (ii) cause an increase in blood-brain barrier permeability through stabilization of endothelial cell stress fibers. We postulate that these events, when occurring repeatedly over a long period of time, might become a health hazard because of the possible accumulation of brain tissue damage. Furthermore, our hypothesis suggests that other brain damaging factors may co-participate in mobile phone radiation-induced effects."

Flawed scoping resulted in omissions of important human studies in addition to animal and in-vitro.

Even if ignoring animal and cellular research were a valid method for determining health effects (which it is not) the report is missing critical human research. Although OHA declared that they reviewed human studies published between Jan. 1, 1993 and April 24, 2020, the report omits numerous relevant studies involving humans published during this time period.

Below are a sampling of important human studies that were omitted from the OHA report:

- A 2020 Yale study funded by the American Cancer Society found that cell phone use was significantly associated with thyroid cancer in people with genetic susceptibilities (Luo 2020).
- Replicated studies on prenatal and postnatal exposures have found associations with behavioural problems in young children (Divan 2012).
- A study by the National Institutes of Health on humans found increased glucose metabolism in the brain region closest to the transmitting cell phone antenna (Volkow 2011).
- A study published in the Public Library of Science found that children with higher blood lead levels, who made more voice calls on their cell phone, were at significantly greater risk of developing ADHD symptoms (Byun et al., 2013).
- A 2017 study examined 1198 mother-child pairs. Utilizing meters indicating personal EMF exposure measurements along with blood lead level during pregnancy the study determined that an increased risk of a child's poor/delayed neurodevelopment (up to 36 months of age) was associated with mobile phone use during pregnancy (Choi 2017).

- A 2017 study found people living closer to cell antennas had higher RFR exposure and had statistically significant higher frequency of micronuclei and greater lipid peroxidation in their blood. These changes are considered biomarkers predictive of cancer (Zothansiama et al., 2017).
- A 2011 study on human subjects exposed to Wi-Fi found gender-related alterations of neural activity (Papageorgiou et al., 2011).
- A 2012 study "Use of laptop computers connected to internet through Wi-Fi decreases human sperm motility and increases sperm DNA fragmentation" found exposure of human sperm to a wireless laptop decreased motility and induced DNA fragmentation by a nonthermal effect" (Avendaño et al., 2012).
- A 2013 study exposed pregnant women's abdomens to a cell phone and found significant changes to their placenta protein expression profile. They concluded " Cell phone EMF might alter the protein profile of chorionic tissue of early pregnancy, during the most sensitive stage of the embryos. The exposure to EMF may cause adverse effects on cell proliferation and development of nervous system in early embryos" (Luo et.al., 2013).

Published case studies such as "Multifocal Breast Cancer in Young Women with Prolonged Contact between Their Breasts and Their Cellular Phones" and "Exacerbation of demyelinating syndrome after exposure to wireless modem with public hotspot" were also not included in the OHA Report.

Ignoring animal data and in vitro (cells grown in labs for experimentation) studies in OHA's investigation of "health effects" means no conclusions can be drawn.

Animal and in-vitro studies are always included in scientific analysis to evaluate health effects. OHA omitted this research. Therefore, any statements of "no links" in the OHA report have no scientific validity nor basis due to the flawed limitations of the scope of the report.

The OHA report's conclusion that, "Overall, there is insufficient evidence to indicate a causal relationship between mobile phone exposures and any cancer endpoint" is simply not a science-based analysis due to the fact that OHA inexplicably ignored the findings of published animal studies.

The International Agency for the Research on Cancer of the World Health Organization (WHO/IARC) monograph on RFR included data from human studies, animal studies and cell studies. Their thorough and proper scientific analysis of the entirety of research conducted prior to 2011 led to the conclusion that wireless radiation was a "possible human carcinogen."

Today, nearly a decade since the evaluation, the NTP, Ramazzini, CERENAT, and Lerchl 2015 studies substantially strengthened the body of evidence, *rendering OHA's conclusion misleading and in direct opposition to conclusions by numerous experts in the field.*

The decision to omit animal and cellular research in OHA's report defies basic principles of prevention by insisting on proof of human harm before taking steps to reduce or prevent exposures. Focusing solely on epidemiology research for this OHA report is unsound, unethical, and endangers public health.

RFR is a relatively recent environmental exposure. Epidemiologic research documents past risks in human populations exposed to toxic substances. It often takes decades to see increases of disease in a human population. Take the example of smoking. The rate of smoking reached close to 70% in US males in the late 1950s, while the rate of lung cancer did not peak until the 1990s. Thus, a lag of nearly four decades took place between an exposure that was shared by most of the population and a major increase in a disease.

The link between the carcinogenic effects of tobacco and cancer did not come about from studying population trends, but by studying high-risk groups using case-control designs of selected cases and comparing their histories with those of persons who were otherwise similar but did not smoke, and cohort studies of groups with identified smoking histories followed for up to 40 years, as in the American Cancer Society and British Doctors studies. The fact that population-based trends do not all show increases in brain cancers does not mean it will not be detectable in the future.

The OHA report omits research or discussion on electromagnetic sensitivity.

The Oregon legislature was provided testimony from children on how they could not attend public school due to health effects from the dense wireless exposures in the classrooms; however, the OHA report did not address this issue at all.

Across North America, teachers and students have initiated legal and civil rights actions related to the need for schools to accommodate individuals requiring low EMF exposures. In 2014, Los Angeles Public School District, the second largest public school district in the US, officially accommodated a teacher by approving her request to have the Wi-Fi turned off in her classroom and alternatively approving a reassignment to a different school site where Wi-Fi had yet to be installed. Read her letter of accommodation here.

Peterborough, Canada has an information sheet to help organizations accommodate individuals who have electromagnetic hypersensitivity. They recommend, among other things:

- Temporarily disabling City owned WAP devices.
- Turning off or minimizing fluorescent and LED lights.

- Notifying attendees to set mobile phones to airplane mode.

Examples of research on electrosensitivity not included in the OHA report:

- Electrohypersensitivity Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It. (2020) Belpomme D and Irgaray P. Int J Mol Sci. 2020 Mar 11;21(6).
- EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses (Belyaev 2016)
- Electromagnetic hypersensitivity (EHS, microwave syndrome) – Review of mechanisms. (2020) Stein Y and Udasin IG. Environmental Research. Vol 186. July 2020
- The Prevalence of People with Restricted Access to Work in Manmade Electromagnetic Environments. (2019) Bevington M. Journal of Environment and Health Science. Vol 5:1, 01-12.
- Neuroimaging Findings in US Government Personnel With Possible Exposure to Directional Phenomena in Havana, Cuba. (2019)Verma R et al. JAMA. 2019;322(4):336-347
- Heuser, G. and S.A. Heuser. "Functional brain MRI in patients complaining of electrohypersensitivity after long term exposure to electromagnetic fields." Rev Environ Health (2017). doi: 10.1515/reveh-2017-0014
- Belpomme D, Campagnac C, Irigaray P., Reliable disease biomarkers characterizing and identifying electrohypersensitivity and multiple chemical sensitivity as two etiopathogenic aspects of a unique pathological disorder. Rev Environ Health, vol. 30, no. 4, 2015, pp. 251-71.
- Sage C. The implications of non-linear biological oscillations on human electrophysiology for electrohypersensitivity (EHS) and multiple chemical sensitivity (MCS). Rev Environ Health. 2015 Sep 12.
- Hedendahl L, Carlberg M, Hardell L. Electromagnetic hypersensitivity - an increasing challenge to the medical profession. Rev Environ Health. 2015;30:209-215.

The OHA report omits research on vulnerable populations, such as the elderly, and medically compromised people, and people with cancer.

The OHA report omits research on vulnerable populations. For those who have cancer, research in both humans and animals has shown a tumor promotion effect.

The study "Decreased survival of glioma patients with astrocytoma grade IV (glioblastoma multiforme) associated with long-term use of mobile and cordless phones" found decreased survival for the most malignant glioma type, astrocytoma grade IV, in long-term users of mobile and cordless phones.

Lerchl et al 2015 found a tumor-promoting effect in RF-EMF exposed mice replicating a 2010 study. "We could fully confirm the previous results, thus the effects are reproducible."

Experts of the National Institute for Occupational Safety and Health have been involved in several research studies which associate non-ionizing EMFs to tumor growth in humans.

Turner et al., 2014 found positive associations between cumulative Extra Low Frequencies (ELF) 1 to 4 years before diagnosis/reference date and glioma and concluded that "occupational ELF exposure may play a role in the later stages (promotion and progression) of brain tumorigenesis.

Vila 2018 states that although "no clear associations were identified...the results obtained for recent exposure to RF electric and magnetic fields are suggestive of a potential role in brain tumor promotion/progression and should be further investigated."

OHA omits a detailed discussion of data gaps in the scientific literature as well as the limitations of the report as it pertains to the question: "Is RFR harmful?"

OHA should have reported the limitations of the synthesis methods used and/or the groupings used in the synthesis and how these affect the conclusions that were drawn in relation to the original review question.

OHA should have been aware that in January 2008, the National Research Council issued a report "The Identification of Research Needs Relating to Potential Biological or Adverse Health Effects of Wireless Communications Devices" which reviewed research needs and gaps and called for the critical need to increase our understanding of any potential adverse effects of long term chronic exposure to RF/microwave energy on children and pregnant woman. OHA should have put forward information on what data gaps documented in the 2008 report still remain. EHT notes the numerous data gaps remain as the issue is minimally funded worldwide.

OHA did not ensure subject matter experts participated in the scope, design or review of the report.

OHA did not ensure subject matter experts participated in the scope, design or review of the report. As Rooney et al., 2014 states, "Prior to conducting an evaluation, the scope and focus of the topic is defined through consultation with subject-matter experts."

OHA lists four authors: Ali Hamade, PhD, DABT an epidemiologist; Hillary Haskins, MS, MPH a health physicist; Blake Buchalter, MPH a graduate student in epidemiology; and Willie Chun Wai Leung, MPH, MS a graduate student in Kinesiology both at Oregon State University.

The reviewers are: André Ourso, JD, MPH Administrator, Center for Health Protection Oregon Health Authority; David Howe, MA, Section manager, Radiation Protection Services Oregon Health Authority; Dean E. Sidelinger, MD, MSEd Health officer and state epidemiologist, Public Health Division Oregon Health Authority; and Duyen L. Ngo, PhD, MPH, Surveillance technical lead, Health Promotion and Chronic Disease Prevention Oregon Health Authority.

None of these authors or reviewers have published on the health or biological effects of non ionizing radiation as far as we are aware. The lack of expertise involved is likely a reason for the fundamentally flawed design/scope of the report.

However, despite their lack of expertise, the responsibility to retract the report rests on the authors and reviewers. Why didn't any of these authors or reviewers question the lack of animal research or call for more expertise? Why do PIAs show the OHA staff circulating an action plan *that does include animal data when they began their research review?*

Clearly the authors of the report lacked technical expertise as they inaccurately defined the proper frequencies for radio frequencies and omitted the word "radiofrequency" (the agent in study) from their search terms.

The January 19, 2020 OHA Website Update and Factsheet on SB 283 has unfactual, debunked industry-tied information,and misleads the public.

On January 19, 2020, OHA updated their website with a FAQ factsheet on SB 283 and a list of resources. OHA's website SB 283 content and OHA SB 283 Factsheet both suffer from the same problems as the report.

The SB 283 FAQs states the OHA report did not include studies on animals "due to limited resources and a lack of funding for the bill." This is an unacceptable response. The children of Oregon deserve a proper scientific review by their health department for an issue so important.

Furthermore, if OHA lacked resources to include animal studies then the report should have noted that the narrow scope inhibited the ability of the "report" to make any sort of determination at all. However, OHA still maintains their conclusions of no evidence, despite the fact that they did not look at all the evidence.

Questions: How much money did OHA get for this report? Who received the money? Were the graduate students on this report hired? Were OHA reviewers paid?

The list of resources on the OHA website are outdated, unfactual, and include industry consultant drafted information.

- The OHA link "Center for Disease Control and Prevention: A brief introduction to ionizing radiation" webpage's content is created with an industry funded consultant as a subject matter expert to the CDC. EHT's FOIA investigation into the CDC revealed that numerous CDC webpages, such as the one OHA references, were created after the CDC brought in consultant Kenneth Foster, a physicist, with longstanding industry ties who has published numerous studies funded by the wireless industry. The CDC website content effectively downplays any health issues the reader might have and even if they clicked through it, it is impossible to get to any scientific citations that show the research associating RFR to adverse effects. Note: The page has not been updated since 2015 and does not link to the NTP animal study.
- The OHA link "Health Physics Society (HPA): On cell phones, non-ionizing radiation and 5G technology" goes to a fact sheet that was adopted in 2009, revised in 2010, and then again in 2020. If you go to the 2010 original (see it here on 12/2010) it states it was written by Kenneth Foster, the industry consultant who was brought into the CDC to help draft website content. A simple compare and contrast of the HPA factsheet from 2010 to 2020 shows that the 2010 sentence "to date, no adverse health effects have been established from cell phone use" is in both versions. Only the 2020 version adds information on 5G and now says "to date, no adverse health effects have been established from cell phone use or being in proximity to cell towers." The new 2020 factsheet states under the section "Health Effects of Radiofrequency Radiation" that, "To date, no credible evidence of adverse health effects has been established for cell phone use or being in proximity to cell towers."
- The 2010 HPA factsheet was up as of October 2020 (see October 2020 Wayback machine archive link that shows the 2010 factsheet was up) and it was updated by January 4, 2020 (see archive link here)

The HPA factsheet OHA presents states:

"**Question:** I am pregnant. Is it safe to use my cell phone?

Answer: A cell phone emits electromagnetic radiation of various frequencies at very low intensity and would not affect the development of a fetus, even if the mother placed the cell phone on her abdomen during her pregnancy. The mother's reproductive and developmental risk for her growing embryo would not be altered by these exposures."

Is the OHA staff content to present these statements regarding pregnancy to the public? OHA is thus putting forward statements that safety is assured *"even if the mother placed the cell phone on her abdomen during her pregnancy."* OHA's presentation of the HPA fact sheet gives the green light to pregnant women resting phones and wireless devices directly on their abdomen.

The HPA Factsheet OHA presents states:

> "**Question:** I am concerned about the nonionizing radiation my four-year-old son get…" **Answer:** health agencies... have consistently failed to find clear evidence of any health hazard.
>
> The HPA fact sheet then links to a Health Physics post by Kenneth Foster which concludes, "speaking for myself, I am reassured that, after a half century of research on the topic, no clear evidence has emerged for health risks from low-level exposure to RF fields…"

Is the OHA staff content to present these statements regarding the exposure to wireless radiation of a four year old child? OHA is putting forward statements that safety is assured even for four year olds. OHA's presentation of the HPA fact sheet gives the green light to parents regarding their young children's use of wireless devices.

The OHA website links to "World Health Organization: Information on non-ionizing radiation" yet omits that the World Health Organization (WHO) EMF project itself has been criticized for conflicts of interest and the entity drafting this information has not done any scientific review of the evidence since 1993.

Note: The WHO EMF Project is *a different entity* than the World Health Organization International Agency for the Research on Cancer although both are under the WHO.

- The International Journal of Oncology published "World Health Organization, radiofrequency radiation and health – a hard nut to crack (Review)." (2017) by Dr. Hardell detailing the conflicts of interest of the WHO EMF as well as the posting of factsheets in a less than transparent fashion. They will not say who wrote the factsheets posted on the WHO website.
- The WHO EMF Project was started with wireless industry funding and is led by an engineer with no medical or health degree.
- According to the WHO webpage, the World Health Organization EMF project has **not** done an evaluation of the current body of research on radiofrequency radiation since 1993. This is stated on the website, "The World Health Organization is undertaking a health risk assessment of radiofrequency electromagnetic fields, to be published as a

monograph in the Environmental Health Criteria Series. This publication will..update the monograph on radiofrequency fields (1993)."

The list of resources on the OHA website omits again the National Toxicology Program (NTP) website. If the reader decides to click on the FAQs they will find that the NTP study is finally referenced, but OHA then links to a critique of the study by ICNIRP.

ICNIRP's claims criticizing the NTP have been debunked by US scientists with expertise in the study and the issue of toxicology.

- The ICNIRP article on OHAs report has been fact checked by US government scientists who state it is wrong. Dr. Ronald Melnick, 28 year NIH scientist who designed the NTP study, published a detailed scientific paper (Melnick 2020) in Health Physics going point by point over ICNIRPs attacks of the study and explaining with data how ICNIRP's criticisms of the NTP are not science based and are unfounded. He concludes, "the NTP studies show that the assumption that RF radiation is incapable of causing cancer or other adverse health effects other than by tissue heating is wrong."
- Dr. Linda Birnbaum, former Director of the US NIEHS references the Melnick evaluation and the fact that the study in her statement included an Amicus Brief (Sandri Brief 2020) for the case EHT vs. FCC. Birnbaum states, "The utility of the NTP investigations has been documented in several publications. [Melnick RL. Commentary on the utility of the National Toxicology Program study on cell phone radiofrequency radiation data for assessing human health risks despite unfounded criticisms aimed at minimizing the findings of adverse health effects." She also states, "Overall, the NTP findings demonstrate the potential for RFR to cause cancer in humans."

Furthermore, ICNIRP is an invite only organization of generally around one dozen scientists, with no oversight, many of whom have been documented to have long standing industry ties. *Documentation of ICNIRP and Conflicts of Interest*

- A 2020 report released by European Members of Parliments Michèle Rivasi (Europe Écologie) and Dr. Klaus Buchner (Ökologisch-Demokratische Partei) accuses the International Commission on Non-Ionizing Radiation Protection (ICNIRP), an organization many governments consider an authority on the safety of 5G and cell phone radiation, of being under the influence of the telecommunications industry and ignoring the science showing their harmful effects. The report written by Hans van Scharen and edited by Tomas Vanheste and Erik Lambert is entitled, "The International Commission on Non-Ionizing Radiation Protection: Conflicts of Interest, Corporate Capture and the Push for 5G."
- Hardell, Lennart. "World Health Organization, radiofrequency radiation and health – a hard nut to crack (Review)." International Journal of Oncology, vol. 51, no. 2, 2017, pp. 405-13.
- Hardell L, Nyberg R. Appeals that matter or not on a moratorium on the deployment of the fifth generation, 5G, for microwave radiation. Mol Clin Oncol. 2020;12(3):247-257. doi:10.3892/mco.2020.1984

- Starkey, Sarah J. "Inaccurate official assessment of radiofrequency safety by the Advisory Group on Non-ionising Radiation" Reviews on Environmental Health, vol. 31, no. 4, 2016.
- Hardell L, Carlberg M. Health risks from radiofrequency radiation, including 5G, should be assessed by experts with no conflicts of interest. Oncol Lett. 2020;20(4):15. doi:10.3892/ol.2020.11876

Dr. Lennart Hardell published a paper entitled Appeals that matter or not on a moratorium on the deployment of the fifth generation, 5G, for microwave radiation explaining how ICNIRP is a private German non-governmental organization of 13 people with "relies on the evaluation only of thermal (heating) effects from RF radiation, thereby excluding a large body of published science demonstrating the detrimental effects caused by non-thermal radiation." He contends that ICNIRP has disregarded research and that their safety guidelines' are are obsolete and protect the industry, not health. Hardells describes the communications between decision makers and the scientists and concludes that, "the majority of decision makers are scientifically uninformed on health risks from RF radiation In addition, they seem to be uninterested to being informed by scientists representing the majority of the scientific community, i.e., those scientists who are concerned about the increasing evidence or even proof of harmful health effects below the ICNIRP guidelines (www.emfscientist.org). Instead, they rely on evaluations with inborn errors of conflicts, such as ICNIRP."

IV. The OHA Report's scope and content do not meet the mandate of SB 283

The OHA Report includes and highlights industry funded research.

The OHA Report reviews and seems to rely on studies funded by the wireless industry despite the fact that the Legislative mandate of SB283 which states, " The Oregon Health Authority shall: (A) Review peer-reviewed, independently funded scientific studies of the health effects of exposure to microwave radiation, particularly exposure that results from the use of wireless network technologies in schools or similar environments; and "The review described in paragraph (a) of this subsection must, at a minimum, consist of a literature review of peer-reviewed, independently funded scientific studies…"

The intention of such wording seems to be that the OHA review should be of "independently funded" studies and we expect this recommendation was due to the undue influence of the telecommunications industry into the science of EMF.

The Harvard Press Book by Norm Alster, "Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates" documents not only the "revolving door" between industry & regulators and the large financial investment by telecommunications companies into lobbying & via "non profit" associations *but also* how the companies have impacted the science via the undermining of the credibility of scientists finding biological effects, cutting research monies for science on health effects, designing and publishing contradictory science and misleading about a "scientific consensus."

> *"Consumer safety, health, and privacy, along with consumer wallets, have all been overlooked, sacrificed, or raided due to unchecked industry influence "*
>
> *"But Dr. Lai found that just over half—actually 56%—of 326 studies identified biological effects. And the results were far more striking when Dr. Lai divided the studies between those that were industry-funded and those that were independently funded. Industry-funded research identified biological effects in just 28% of studies. But fully 67% of non-industry funded studies found biological effects."*
>
> *"A study conducted by Swiss and British scientists also looked at how funding sources affected scientific conclusions on the possible health effects of cell phone usage. They found that of studies privately funded, publicly funded and funded with mixed sponsorship, industry-funded studies were —least likely to report a statistically significant result.‖31 —The interpretation of results from studies of health effects of radiofrequency radiation should take sponsorship into account, the scientists concluded."*

-Norm Alster, "Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates"

Huss et al. 2014 found that "studies funded exclusively by industry [telecommunications] were indeed substantially less likely to report statistically significant effects on a range of end points that may be relevant to health" and cautions that " interpretation of results from studies of health effects of radiofrequency radiation should take sponsorship into account."

The following studies were cited in the OHA review and were financially supported by industry. The statements below in quotes regarding funding are quoted directly from the papers themselves.

- Elliott et al. 2010 (OHA citation 9) which states, "Funding: The study was funded through the UK Mobile Telecommunications Health Research (MTHR) Programme (www.mthr.org.uk), an independent body set up to provide funding for research into the

possible health effects of mobile telecommunications. The MTHR is jointly funded by the UK Department of Health and the mobile telecommunications industry."

- Muscat et al. 2000 (OHA citation 23) states, "This project was supported by a contract from Wireless Technology Research LLC" -a research program set up by the Cellular Telephone Industry Association (CTIA).
- Johansen et al. 2001 (OHA citation 25) states, "Supported by grants from the two Danish operating companies (TeleDanmarkMobil and Sonofon)."
- Momoli et al. (OHA citation 51) states, "The UICC received funds for this purpose from the Mobile Manufacturers' Forum and GSM Association" and "Ottawa and Vancouver components of the study were supported by a university-industry partnership grant from the Canadian Institutes of Health Research (CIHR), the latter including partial support from the Canadian Wireless Telecommunications Association."
- Schoemaker et al. 2005 (OHA citation 52) states, "The UICC received funds for this study from the Mobile Manufacturers' Forum and the GSM Association. Provision of funds to the Interphone study investigators via UICC was governed by agreements that guaranteed Interphone's complete scientific independence. Both UK centres were also supported by the Mobile Telecommunications and Health (MTHR) Programme, and the Northern UK centre received funding from the Health and Safety Executive, the Department of Health, the Scottish Executive and from the UK Network Operators (O2, Orange, T-Mobile, Vodafone, '3'), under legal signed contractual agreements that ensure complete independence for the scientific investigators." EHT notes several of the authors are now known as financed by Telecom and in fact A. Ahlbom was taken off the WHO/IARC EMF Working Group in 2011 due to industry ties.
- Schuz et al. 2006 (OHA citation 53) states, "The UICC received funds for this purpose from the Mobile Manufacturers' Forum and the GSM Association."
- Cardis et al., 2011 (OHA citation 55) states, European Union Fifth Framework Program International Union against Cancer UICC received funds for this purpose from the Mobile Manufacturers' Forum and GSM Association" and "Funding in France included 5% from three network operators (Orange, SFR, Bouygues Télécom "university–industry partnership grant from the Canadian Institutes of Health Research (CIHR),the latter including partial support from the Canadian Wireless Telecommunications Association
- Klaeboe et al. (OHA citation 58) states, "The UICC received funds for this purpose from the Mobile Manufacturers' Forum and GSM Association."
- Lahkola et al. (OHA citation 59) states, "UICC received funds for this purpose from the Mobile Manufacturers' Forum and GSM Association" and "The UK study was supported by the Mobile Telecommunications, Health and Research (MTHR) program."
- Hepworth et al. 2006 (OHA citation 60) states, "The University of Leeds has received some financial support on behalf of the four centres of the UK northern study from the UK network operators (O2, Orange, T-Mobile, Vodafone, 3) under legal signed

contractual agreements which ensure complete independence for the scientific investigators. While employed at the University of Birmingham MJAvT received funding from O2, Orange, T-Mobile, and Vodafone to carry out a feasibility study of health effects from radiofrequency exposure among employees of broadcasting and telecommunication industries"

- Lonn et al. 2005 (OHA citation 62) states, "The UICC received funds for this purpose from the Mobile Manufacturers' Forum and GSM Association."
- Sadetzki et al. 2008 (OHA citation 63) states, funding was from the UK Mobile Telecommunications and Health (MTHR) Programme and "The UICC received funds for this purpose from the Mobile Manufacturers' Forum and the GSM Association."
- Poulsen et al. 2013 (OHA citation 27) Establishment of the original cohort was supported by grants from the 2 Danish operating companies (Tele Danmark Mobil and Sonofon)
- Thomas et al. (2010) (OHA citation 79) OHA itself states funding was from " Government and mobile telecommunications industry" and the paper itself states "Funding" The study and Geza Benke were supported by the National Health and Medical Research Council (NHMRC) of Australia… Rodney Croft has received funds to conduct research from both the government and the mobile telecommunications industry." Furthermore the National Health and Medical Research Council (NHMRC) of Australia receives funds for EMF research through the Australian Mobile Telecommunications Association (AMTA) as documented in a June 2019 FOIA.
- Muscat et al. 2006 (OHA citation 126) OHA states "funded directly by telecom association" and then OHA states, "Do not recommend for inclusion in review." Yet other industry funded papers by Muscat were included.
- Muscat et al. 2002 (OHA citation 134) states "Supported by a contract from Wireless Technology, Inc. and Public Health Service grants NCI 32617, 68384, and 17613" We believe Wireless Technology, Inc. is the research program set up by the Cellular Telephone Industry Association (CTIA).
- Hallberg 2007 (OHA citation 122) OHA states, "Author works for Ericsson" a telecommunications company.

Importantly, OHA highlights several of these industry funded studies describing them in detail in the OHA report on page 16 for example which highlights the Danish Cohort studies and states, " Both retrospective and prospective cohort studies have been completed to examine the risk of cancer from mobile phone use… and the studies "found no increased risk."

The Danish cohort studies OHA reviewed (and cited above) were funded by industry - the design itself developed with industry funding and from that design came numerous publications. Furthermore, the IARC did not weigh the study findings heavily due to numerous fundamental flaws. IARC's Robert Bann wrote that the Danish cohort exclusion of the corporate subscribers

"seems remarkable" and "could have resulted in considerable misclassification in exposure assessment."

Several experts wrote letter to the journal about the fundamental flaws in the danish cohort research:

- Philips A, and G. Lamburn. "Updated study contains poor science and should be disregarded." BMJ, vol. 343, 2011.
- Ahlbom, Anders, et al. "Re: Cellular telephone use and cancer risk: update of a nationwide Danish cohort study." Journal of the National Cancer Institute, vol. 99, no. 8, 2007, pp. 655.
- Kundi, Michael. "Re: Cellular Telephone Use and Cancer Risk: Update of a Nationwide Danish Cohort." Journal of the National Cancer Institute, Letter to the Editor, 2006.
- Leszczynski, Dariusz. "Re: Use of mobile phones and risk of brain tumours: update of Danish cohort study." BMJ, vol. 343, 2011.
- Davis, Devra, Ronald Herberman and Yael Stein. "Re:Not enough data excluding cellphones' morbidity." Review of Use of mobile phones and risk of brain tumours: update of Danish cohort study, by Schuz, et al. BMJ, vol. 343, 2011.
- Henshaw, Denis. "Mobile phone radiation could be detected by the human brain." Review of Use of mobile phones and risk of brain tumours: update of Danish cohort study, by Frei, et al. BMJ, vol. 343, 2011.
- Khurana, Vini. "Danish cohort study: Questions regarding selection, exposure, and tumour incidence." Review of Use of mobile phones and risk of brain tumours: update of Danish cohort study, by Frei, et al. BMJ, vol. 343, 2011.
- Frey, Allan H. "On the Safety of Cell Phone Radiation." Review of Use of mobile phones and risk of brain tumours: update of Danish cohort study, by Frei, et al. BMJ, vol. 343, 2011.
- Morgan, Lloyd L. "The Danish Cellphone Subscriber Study on the Risk of Cancer Among Subscribers Is Fundamentally Flawed." Review of Use of mobile phones and risk of brain tumours: update of Danish cohort study by Frei, et al. BMJ, vol. 343, 2011.
- Reviews of "Use of mobile phones and risk of brain tumours: update of Danish cohort study" by Frei, et al. BMJ, vol. 343, 2011.

Industry supported scientists are cited numerous times in the Oregon Report.

One of the authors to the industry funded Danish Cohort studies was epidemiologist Christoffer Johansen. The OHA report supports numerous studies with Johansen as author including OHA citations 25, 27, 28, 120, 121, 124 and 129.

Just recently, reports document how Johansen was found to receive fees from industry in relation to his work on EMF from 1994 to 2004. To learn more please read a July 2019 article "Management expert: Radiation consultant at the National Board of Health incompetent for a number of years" which states, "Researcher and doctor Christoffer Johansen received personal fees from industry organizations and research funds from the telecommunications and electricity industries, although he advised the National Board of Health on the same topics. It is against the Public Administration Act."

While OHA could not have been aware of these revelations, OHA *should have been aware* that Poulsen et al. 2013 (OHA citation 27) and Johansen et al. 2001 (OHA citation 25) state "Supported by grants from the two Danish operating companies (TeleDanmarkMobil and Sonofon)".

Numerous other authors listed in research papers cited by OHA are known to have received financial support from industry in their research such as Boice (TeleDanmarkMobil and Sonofon), Wood AW (Telstra), Loughran (EPRI) and Feychting (EPRI). McKenzie RJ is Manager of Mobile Phone Carriers Forum.

Conflicts of interest into the science and policy on non ionizing radiation are a serious challenge in the science of non-ionizing electromagnetic fields.

Investigative reports on industry influence have revealed industry influence and unchecked conflicts of interest into the science and policy of wireless.

"We found that the studies funded exclusively by industry were indeed substantially less likely to report statistically significant effects on a range of end points that may be relevant to health. Conclusions: The interpretation of results from studies of health effects of radiofrequency radiation should take sponsorship into account."- "Source of Funding and Results of Studies of Health Effects of Mobile Phone Use: Systematic Review of Experimental Studies."

Investigative reports and articles documenting this challenge and the "undue influence" of the wireless industry include the following:

- Wireless Hazards by Barbara Koepell in the Washington Spectator
- The Harvard Press Book by Norm Alster, "Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates"
- Investigate Europe's Three Part Investigation on 5G
    - "The ICNIRP Cartel: Who's Who in the EMF Research World

    - 5G The Mass Experiment (Part 1)
    - How Much is Safe? Finances Effect Research (Part 2)
    - Real 5G issues overshadowed by Covid-19 conspiracy theories (Part 3)
- A report released by European Members of Parliament "The International Commission on Non-Ionizing Radiation Protection: Conflicts of Interest, Corporate Capture and the Push for G." (PDF)
- "The Disinformation Campaign—And Massive Radiation Increase—Behind The 5G Rollout" by Mark Hertsgaard And Mark Dowie in The Nation April 23, 2018
- War on 5G: Amsterdam Investigation into Scientists Finds Telecom Influence by Jannes van Roermund and Paul Thacker, De Telegraaf (Amsterdam), Jun 2, 2020 (English translation) on the American Council on Science and Health attacks against Prof. Moskowitz and more.
- Is 5G Going to Kill Us, The New Republic by Christopher Ketcham
- Democracy Now: How the Wireless Industry Convinced the Public Cellphones Are Safe & Cherry-Picked Research on Risks
- Project Censored Investigations: How Big Wireless Convinced Us Cell Phones and Wi-Fi are Safe, "PhoneGate:" French Study Finds 9 of 10 Cell Phones Exceed Safe Radiation Limits.
- Seattle Magazine, "UW Scientist Henry Lai Makes Waves in the Cell Phone Industry." Seattle Magazine on Motorola working to create doubt and attack Dr. Lai's research finding DNA damage.
- The Lies Must Stop Disband ICNIRP: Facts Matter, Now More Than Ever by Louis Slesin in Microwave News. Apr 9, 2020.
- Will WHO Kick Its ICNIRP Habit? Non-Thermal Effects Hang in the Balance. Microwave News, Nov 4, 2019.
- We Have No Reason to Believe 5G is Safe. Scientific American, by Joel Moskowitz PhD
- There's a clear cell phone-cancer link, but FDA is downplaying it. The Hill, Ronald Melnick, Ph.D.

As an example of how industry funded studies more often show no effect, "'Radiation Research' and The Cult of Negative Results" in Microwave News, vol. 26, no. 4, 2006 reviewed a subset of health studies published in peer-reviewed scientific journals. They selected papers on microwave-induced genotoxicity and identified 85 radiofrequency (RF)/microwave-genotox papers published since 1990 and detailed the following findings: 43 found some type of biological effect and 42 did not. 32 of the 35 studies that were paid for by the mobile phone industry and the U.S. Air Force show no effect. These make up more than 75% of all the negative studies. They looked at the journal Radiation Research which in over the last 16 years, only one positive paper on microwave genotoxicity has appeared and found:

- 80% of the negative papers (17 out of 21) published in Radiation Research were paid for by either industry or the U.S. Air Force.
- The lead author of the lone positive paper, was denied money for a follow-up and soon moved on to other research areas.

- They suspect the Radiation Research's bias against EMF effects is attributed to John Moulder, (editor in 1991 and senior editor in 2000) a long standing consultant to the power, electronics and communications industries.
- "Radiation Research has become a repository for negative papers and thus an important part of the industry and military strategy to neutralize those who dare to challenge the no-effects dogma. Their work had been made much easier with John Moulder on the inside to ease industry papers into print."

Publications documenting and discussing the industry influence into the science of electromagnetic fields include:

Huss, Anke, et al. "Source of Funding and Results of Studies of Health Effects of Mobile Phone Use: Systematic Review of Experimental Studies."Environmental Health Perspectives, vol. 115, no. 1, 2007, pp. 1-4.

- This 2007 systematic review examined whether the source of funding of studies of the effects of low-level radiofrequency radiation is associated with the results of studies and found industry funded studies were substantially less likely to report effects.
- "We examined the methodologic quality and results of experimental studies investigating the effects of the type of radiofrequency radiation emitted by handheld cellular telephones. We hypothesized that studies would be less likely to show an effect of the exposure if funded by the telecommunications industry, which has a vested interest in portraying the use of mobile phones as safe. We found that the studies funded exclusively by industry were indeed substantially less likely to report statistically significant effects on a range of end points that may be relevant to health. Conclusions: The interpretation of results from studies of health effects of radiofrequency radiation should take sponsorship into account."

Hardell, L., Carlberg, M." Health risks from radiofrequency radiation, including 5G, should be assessed by experts with no conflicts of interest". Oncology Letters 20.4 (2020): 15. Download PDF

- "There appears to be a cartel of individuals working on this issue."

Hardell, Lennart. "World Health Organization, radiofrequency radiation and health – a hard nut to crack (Review)." International Journal of Oncology, vol. 51, no. 2, 2017, pp. 405-13.

- "Michael Repacholi immediately set up a close collaboration between WHO and ICNIRP (being head of both organizations) inviting the electric, telecom and military industries to meetings. He also arranged for large part of the WHO EMF project to be financed by the telecommunication industry's lobbying organisations; GSM Association and Mobile Manufacturers Forum, now called Mobile & Wireless Forum (MWF) (51) in addition to WHO, see the International EMF Project, Progress Report June 2005–2006 (http://www.who.int/peh-emf/publications/reports/IAC_Progress_Report_2005-2006.pdf"

Hardell L, Nyberg R. Appeals that matter or not on a moratorium on the deployment of the fifth generation, 5G, for microwave radiation. Mol Clin Oncol. 2020 Mar;12(3):247-257. doi: 10.3892/mco.2020.1984. Epub 2020 Jan 22. PMID: 32064102; PMCID: PMC7016513.

- "One issue of major concern is that there seems to be conflicts of interest among persons in the evaluating groups. Furthermore the same persons may often be found in different bodies, thereby in fact citing themselves representing a cartel (https://www.saferemr.com/2018/07/icnirps-exposure-guidelines-for-radio.html). This has been outlined in peer-reviewed publications (9,10)."

Hardell L., et al. "Secret ties to industry and conflicting interests in cancer research." American Journal of Industrial Medicine, vol. 50, no. 3, 2007, pp. 227–33.

- "Another example of industry ties to research, but not one where there was a failure to disclose, involves the potential association between cellular phones and brain tumors. In 2002 the Swedish Radiation Protection Authority (SSI) hired two US epidemiologists to review published epidemiological studies on the relationship between the use of cellular telephones and cancer risk. They were Dr. John D. Boice, Jr. and Dr. Joseph K. McLaughlin from the private company International Epidemiology Institute (IEI)."

David O. Carpenter, Extremely low frequency electromagnetic fields and cancer: How source of funding affects results, Environmental Research, Volume 178, 2019

- "A major goal of this study is to examine how source of funding influences the reported results and conclusions. Several meta-analyses dating from about 2000 all report significant associations between exposure and risk of leukemia."
- "By examining subsequent reports on childhood leukemia it is clear that almost all government or independent studies find either a statistically significant association between magnetic field exposure and childhood leukemia, or an elevated risk of at least OR = 1.5, while almost all industry supported studies fail to find any significant or even suggestive association."

Prasad, M., et al. "Mobile phone use and risk of brain tumours: a systematic review of association between study quality, source of funding, and research outcomes." Neurological Sciences, 2017.

- "In our review of the literature and meta-analysis of case–control studies, we found evidence linking mobile phone use and risk of brain tumours especially in long-term users (greater than 10 years). We also found a significantly positive correlation between study quality and outcome in the form of risk of brain tumour associated with use of mobile phones. Higher quality studies show a statistically significant association between mobile phone use and risk of brain tumour. Even the source of funding was found to affect the quality of results produced by the studies."
- "The meta-analysis of case–control studies found that there is a significant positive correlation between study quality and risk of brain tumour associated with use of mobile phones. Higher quality studies show a statistically significant association between mobile phone use and risk of brain tumour, but adding poor quality studies leads to loss of significance. We found that Government funded studies were generally of higher methodological quality than phone industry funded or mixed funded."

"Electromagnetic fields, 5G and health: what about the precautionary principle?", Journal of Epidemiology and Community Health, January 2021

- " This essay identifies four relevant sources of scientific uncertainty and concern: (1) lack of clarity about precisely what technology is included in 5G; (2) a rapidly accumulating body of laboratory studies documenting disruptive in vitro and in vivo effects of RF-EMFs—but one with many gaps in it; (3) an almost total lack (as yet) of high-quality epidemiological studies of adverse human health effects from 5G EMF exposure specifically, but rapidly emerging epidemiological evidence of such effects from past generations of RF-EMF exposure; (4) persistent allegations that some national telecommunications regulatory authorities do not base their RF-EMF safety policies on the latest science, related to unmanaged conflicts of interest."
- "Finally, Carpenter has recently published a well-researched analysis of how source of funding correlates with study find- ings, across many peer-reviewed publications over the last few decades, of the relationship between various kinds of EMF expo- sure and several cancers. He shows convincingly that studies funded by private sector entities, with strong vested interests in maintaining their current use of the sources of EMFs under study, tend to find no association—whereas studies funded by public sector or independent sources find the opposite. As Carpenter points out, this suggests that many systematic reviews and meta- analyses in this field, having failed to correct for this 'source of funding bias,' likely underestimated the evidence for causation."

Valentini, E., et al. "Republished review: systematic review and meta-analysis of psychomotor effects of mobile phone electromagnetic fields."Postgraduate Medical Journal, vol. 87, no. 1031, 2011, pp. 643-51.

"The existence of sponsorship and publication biases should encourage WHO intervention to develop official research standards and guidelines. In addition, future research should address critical and neglected issues such as investigation of repeated, intensive and chronic exposures, especially in highly sensitive populations such as children."

Marino, Andrew A. and Simona Carrubba. "The Effects of Mobile-Phone Electromagnetic Fields on Brain Electrical Activity: A Critical Analysis of Literature." Electromagnetic Biology and Medicine, vol. 28, no. 3, 2009, pp. 250-74.

- ...with 87% of brain activity studies sponsored by the mobile phone industry, the issue of conflicts of interest cannot be ignored.
- "Overall, the doubt regarding the existence of reproducible mobile-phone EMFs on brain activity created by the reports appeared to legitimate the knowledge claims of the mobile-phone industry. However, it funded, partly or wholly, at least 87% of the reports. From an analysis of their cognitive framework, the common use of disclaimers, the absence of information concerning conflicts of interest, and the industry's donations to the principal EMF journal, we inferred that the doubt was manufactured by the industry. The crucial scientific question of the pathophysiology of mobile-phone EMFs as reflected in measurements of brain electrical activity remains unanswered, and essentially unaddressed."

"'Radiation Research' and The Cult of Negative Results." Microwave News, vol. 26, no. 4, 2006. This analysis reviewed a subset of health studies published in peer-reviewed scientific journals. They selected papers on microwave-induced genotoxicity and identified 85 radiofrequency (RF)/microwave-genotox papers published since 1990 and detailed the following findings: 43 found some type of biological effect and 42 did not. 32 of the 35 studies that were paid for by the mobile phone industry and the U.S. Air Force show no effect. These make up more than 75% of all the negative studies. They looked at the journal Radiation Research which in over the last 16 years, only one positive paper on microwave genotoxicity has appeared and found:

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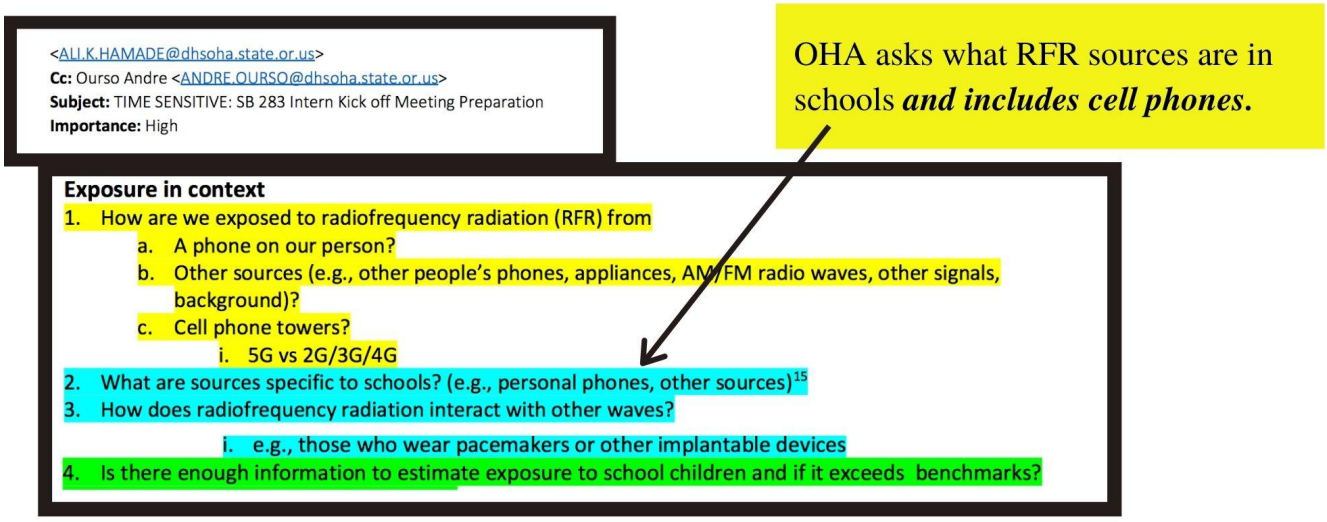
The OHA report omits research characterizing RFR exposures in the school setting and did not attempt to measure actual RFR exposures in schools despite the fact that PIAs reveal their initial plan included consideration of this issue.

OHA did not follow best practices for systematic review which would include first defining the objectives of the evaluation and identifying the key questions to be addressed. If the objective of the review was to determine if RFR in schools is hazardous, then examples of key questions would be: 1) What research exists on RFR exposure assessment for schools, buildings and outdoor areas? And 2) What are the sources of RFR exposure in classrooms and on school property?

How could OHA report on an environmental exposure without understanding what levels of the exposure actually exist?

As it turns out PIAs reveal OHA did at first plan to look at what RFR exposures existed in school. Please see below excerpts of screen saves from the PIA request.

Public Information Request to Oregon Health Authority
Show OHA Initially Interested in RFR School Exposures



Despite their lack of adequate research review OHA decided to still make a conclusion on whether RFR was a hazard or not and specifically refers to "microwave exposures similar to those in school settings" yet OHA has presented no data or definition of what they mean by RFR in the school setting and *more importantly,* the OHA report is presenting *inaccurate assumptions* as to what the levels of exposure will be.

The OHA 2 page FAQs erroneously states *"OHA found insufficient evidence for a causal relationship between microwave exposures similar to those in school settings and cancer endpoints...Overall, OHA found insufficient evidence to conclude that RFR exposures similar to those in school settings are associated with adverse noncancer health effects."*

How can OHA put such a statement forward as research clearly documents that RFR exposure to any one person is a combination of near field exposure (from devices in use, in contact or very close to the person) and far field exposure (from cell tower antenna or base station antennas like Wi-Fi routers at a distance from the body). "Near field exposures" will create localized exposures- high levels into a smaller area. "Far field exposures" will create whole body exposures.

OHA did not present any research characterizing exposures in the school environment. They did not:

- Investigate the degree to which cell phones are powered on in classrooms.
- Investigate how students carry cell phones on their body while in school and where the cell phones are in relation to a child's body.

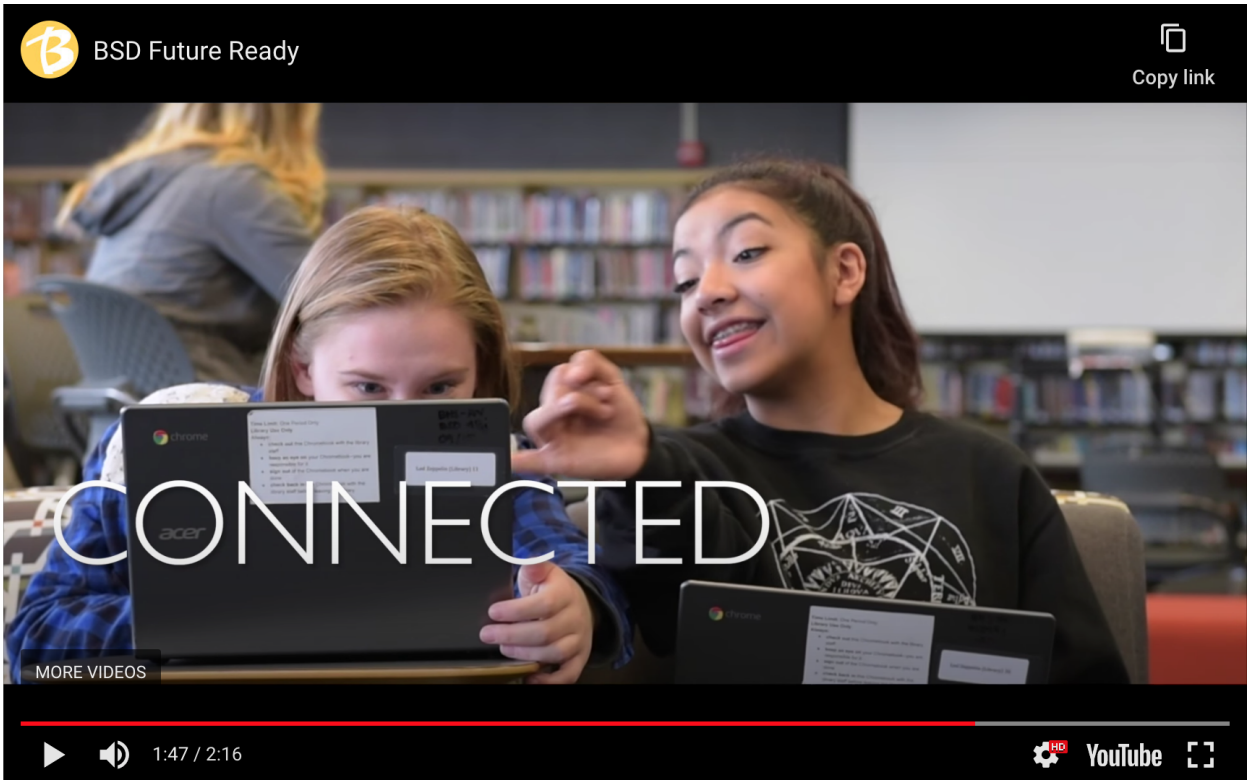
- Determine how many hours a day the phones are powered on while children are in school each day.
- Determine if students are using cell phones up to their head on school grounds.
- Determine how students are using cell phones in terms of video, texts, voice calls and other applications as video and images can result in the highest exposures.
- Determine if students are using the school Wi-Fi network or cellular and for what applications as this will impact the exposure.
- Determine the strength of the signal in various areas and if students are using the service which again will impact the amount of radiation transmitted and the exposure to students.
- Identify what type of Wi-Fi networks are in use in schools as some routers have higher emissions than others.
- Identify many hours a day are children using Wi-Fi devices and gather data on the way devices are used (on a table or on a lap).
- Gather data on wireless accessory use such as airpods, wireless headphones, keyboard and mouse?
- Gather data on how many schools use virtual reality with smartphones.
- Gather data on how many schools have cell towers on their property or in close proximity.
- Gather data on RFR measurements or reports from cell towers on or near school property.

Oregon schools create multiple sources of RFR exposure for children and staff. OHA has no factual basis to present assumptions regarding the level of exposure in the classroom and no factual basis to present the illusion that school exposure is "low".

Fact: Students in Oregon classrooms are exposed to cell phones and wireless devices in close range to the body.

Many Oregon school districts have Bring Your Own Device (BYOD) policies such as Portland schools whose BYOD policy gives permission for personal devices to be brought on school grounds and access the District's Guest wireless network. Virtual reality in which transmitting smartphones are placed in front of students' eyes are used in Oregon schools (Oregon State University 2020, News 1310 2018, Harney County Schools 2017).

Images from Beaverton School District in Oregon



An article on the [Oregon Newberg Public Schools webpage] states "Kindergarten, first and second grade students will be using iPads, while third through fifth grade students will use Chromebooks to create, collaborate, communicate and think critically."

Picture from a time-lapse movie of Newberg Oregon district staff unpacking hundreds of new iPads and Chromebooks [Link.]

- On September 23, 2019 [Verizon's press release] states ", three Portland schools will join the Verizon Innovative Learning Schools initiative."
- Reynolds School District [proclaimed on their website] that "Reynolds School District is excited to announce that all middle school students will be receiving individual iPads and a free monthly data plan this fall! HB Lee, Reynolds, and Walt Morey Middle Schools have been selected by

Verizon Innovative Learning to put technology in the hands of our middle school students to foster a more innovative and exciting learning environment."

- Verizon created a video you watch here on the distribution of devices.
- Furthermore, during the pandemic the school district is utilizing wireless devices without presenting information to students and parents on how to reduce exposure. The Fox 12 news report "Lake Oswego School District begins handing out devices to students for distance learning" details how "students in kindergarten through 2nd grade will be getting iPads, while Chromebooks will be handed out to 3rd through 12th grade students."

OHA states on page 5, "It is important to reiterate that the studies reviewed in this report were mostly unrelated to school settings" however, ***this assertion by OHA is wrong.***

See below an image of a child in Oregon schools with a device on her lap.

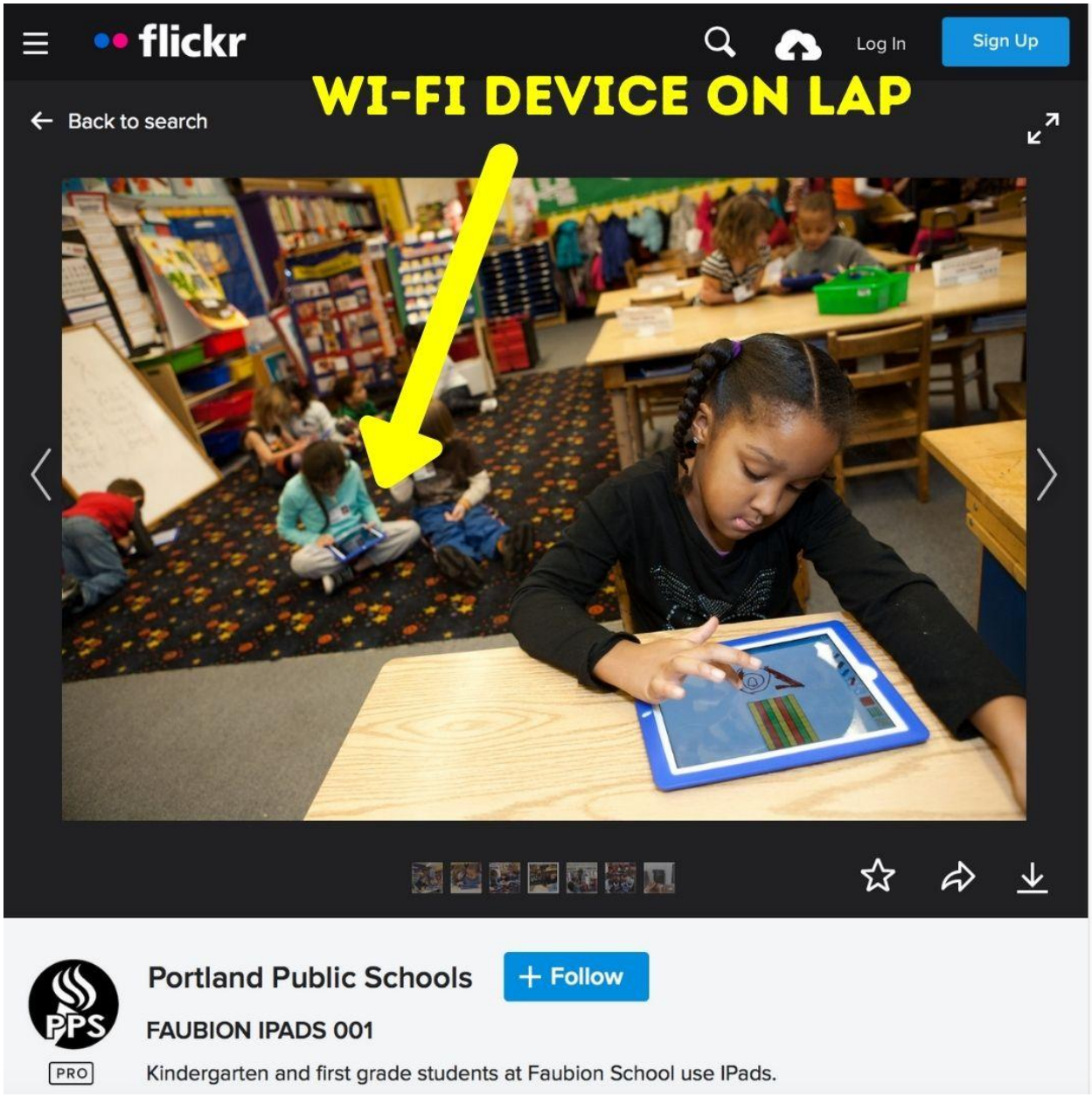
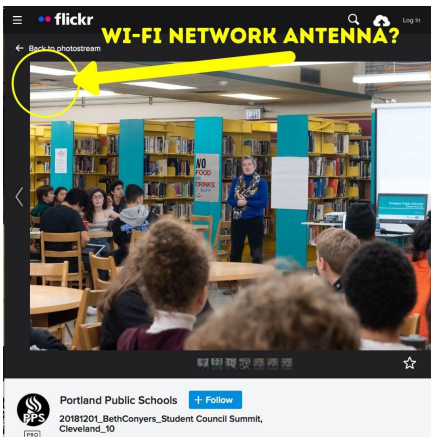


Image from Flicker *Photos by Katharine Kimball www.KatharineKimballWeddings.com. Link https://www.flickr.com/photos/41430185@N08/11862259923/in/photolist-92tt2S-92qmPP-92tt3b-92tt1q-VzDvos-JRYoqA-j5cF2n-j5eZYA-j5cKSp-j5eczn-j5eW65-j5h1LL-j5ee2R-j5ebAP-j5h19o-j5eXus-apqSGV*

Research indicates children are exposed to RFR in schools from various sources. Please see a short list of RFR exposures in the Oregon school setting along with images from Oregon Schools.

<table>
<tr>
<td> 

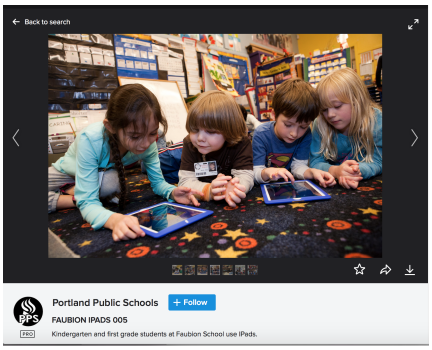
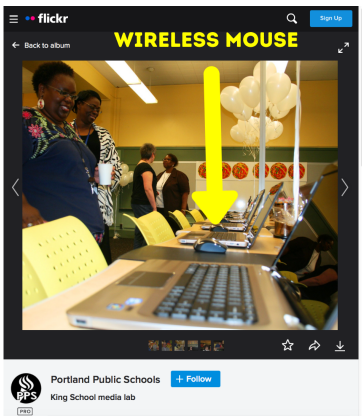
Link to image that seems to show wireless access point on ceiling. https://www.flickr.com/photos/41430185@N08/46115012292/in/photostream/</td>
<td>Wi-fi Networks
Omitted from OHA's review "Measurements of Radiofrequency Radiation with a body-borne exposimeter in Swedish schools with Wi-Fi" measured RFR exposures in school settings and found higher RF levels when students streamed videos and lower RFR in classrooms without Wi-Fi and without students on Wi-Fi devices. Hedendahl et al., 2017 also reviewed the published findings of previous research studies on children's school exposures which document that children are exposed from multiple sources including cell towers/base stations, cell phones and Wi-Fi, all of which contribute to total exposure.</td>
</tr>
<tr>
<td> 

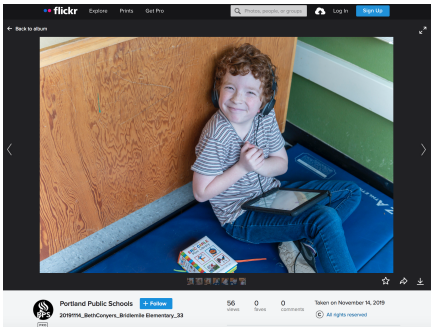
Image credit: FAUBION IPADS 005
Kindergarten and first grade students at Faubion public School use IPads.Photos by Katharine Kimball
www.KatharineKimballWeddings.com
Link</td>
<td>Wireless devices and accessories
The closer the device to a child's body, the higher the measured RFR values (Ferreira et al., 2015).

A 2015 paper entitled Specific Absorption Rate (SAR) in the head of Tablet user's documents how RFR radiation from a tablet penetrates into a children's skull, eyes and brain when positioned in front of a child's face. They conclude in their paper that, "These devices may be used for many hours each day by adults, adolescents and children, several days a week, and many months each year. Therefore, special precautionary procedures should be taken in order to avoid health risks due to long periods of exposure."</td>
</tr>
</table>



Link to image that shows wireless mouse
https://www.flickr.com/photos/41430185@N08/5833520664/in/album-72157626837481899/

Link to another image of laptop on lap in Portland Schools.
https://www.flickr.com/photos/41430185@N08/49066991606/in/album-72157711785430207/



Device on child's lap from Flickr link here and http/www.bethconyers.com

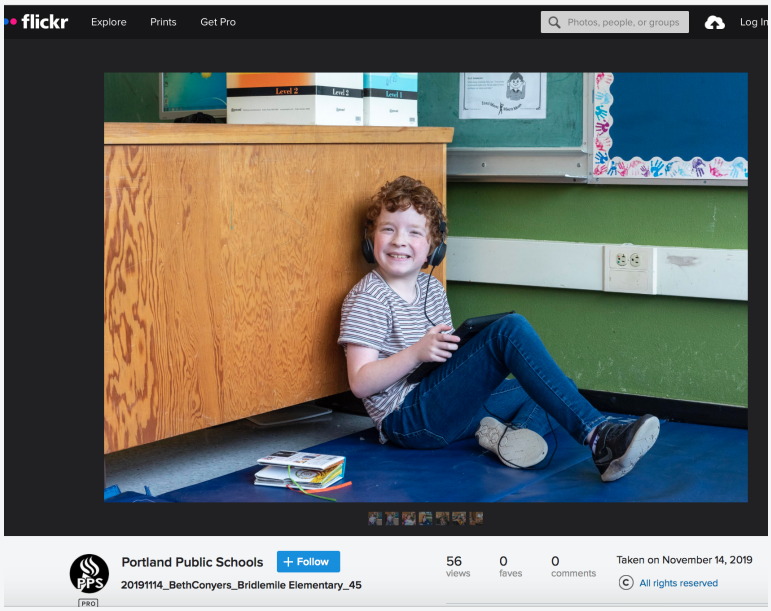


Image from Portland Schools of Students with cell phones on school property.

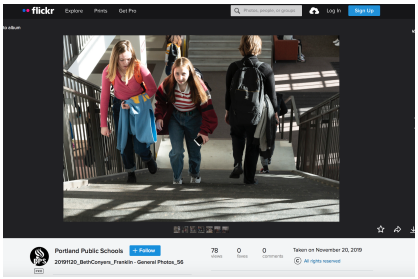
Copyright - @2017Beth Conyers

Link to image on Flicker
https://www.flickr.com/photos/41430185@N08/49125046417/in/album-72157711939846367/

Cell phones:

While most students will not be using cell phones against their head all day in school, they *will* have their cell phones powered on. A typical classroom scenario involves each child with a cell phone, many of which will be in students' pockets, bras or resting in laps on their legs.
This means in a classroom of thirty children with one teacher there could be 31 cell phones.

Any given person would be exposed to emissions from their own phone most intensely as well emissions from the phones of others. This means that phones in body contact positions could result in exposures that exceed FCC limits up to 11 times (Gandhi 2019). The European Commission's Seawind Project 2012 found cell phones in the back pants pocket had higher RF measurements



Link to image
20191120_BethConyers_Franklin - General Photos_56
https://www.flickr.com/photos/41430185@N08/49124861621/in/album-72157711939846367/

compared to in the front pocket due to the higher fat content. However the phone in the front pocket "radiates more towards thermosensitive organs, e.g., testes, compared to the back trousers pocket" (Seawind Project). Many schools have classes where cellphones are used as part of the curriculum during the school day.

We would expect the school is responsible for RFR exposures from cell phones used on school property.

Here is an image of a child in a Portland elementary school with a cell phone during class time. Link to image on Flickr

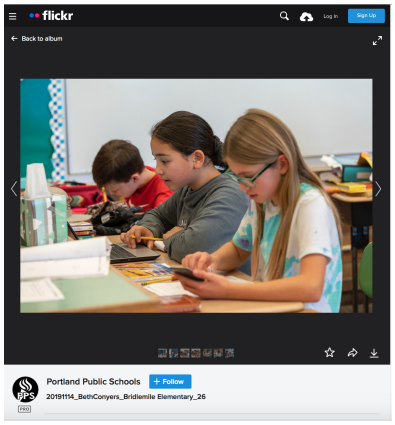
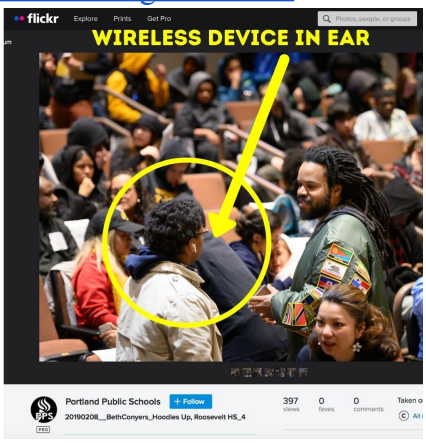


Image from Oregon Public School video found here
https://www.youtube.com/watch?time_continue=79&v=34It0MUY490&feature=emb_logo

Virtual Reality (VR) systems:
Research published in Environmental Research simulated microwave radiation from VR, and found specific areas of the eyes and critical parts of the brain absorbed between 2 to 5 times more cell phone radiation in the youngest child model compared to the adult model (Fernandez et al., 2018).

Nearby Cell Towers and Cell Antennas:

Cell towers near Oregon schools can elevate ambient RFR exposures to children who do not even use cell phones (Choi et. al., 2018). Indoor exposure in buildings is

Image from petition regarding cell tower at Elk Meadow Elementary  Paul Bacon and Elizabeth Hanley Szabo stand outside the Bend City Council chambers with a group of Elk Meadow Elementary parents who are protesting a planned Verizon cell phone tower near the school.	influenced by the position of the windows with respect to the antenna (De Giudici et al., 2020). Research has found that children in kindergartens with nearby antenna installations had nearly three and a half times higher RF exposures than children with installations further away, in this case more than 300 meters (Bhatt 2016). Zothansiama 2017 found homes closer to cell antennas (within a perimeter of 80 m of mobile base stations) had measurably higher RFR (as well as significantly higher frequency of micronuclei and changes to various antioxidants in plasma) This could be extrapolated to school buildings.
Image of airpod or some sort of wireless device in student ear in Portland Schools. Link to image on Flickr  	**Bluetooth and Wearable Technology**: Bluetooth devices have three possible power levels, 100, 2.5, and 1 mW with bursts frequencies of 1600 Hz and harmonics (Seawind 2012). Bluetooth 5 can have a range up to 800 feet and it is being built into new earbuds, cell phones and laptops. Researchers have investigated children's exposures from Google glasses and Bluetooth devices. Pizarro et. al., 2014 concludes that standards only consider the health effects of short term exposures and "as these portable devices may be used for a long time very close to the user's head, even low level exposure can be dangerous for the user's health, especially for children and adolescents."

In addition, there are numerous other wireless networks planned related to applications in the building such as HVAC and lighting. On February 2, 2021 AirTest Technologies Inc.announced the TR9700-wifi CO_2, a "temperature, humidity and pressure sensor specifically designed for applications in school classrooms to ensure safe ventilation levels in this era of COVID concerns….This new three year, California grant program is intended to install CO_2 sensors for monitoring in school classrooms as a continuous check of ventilation levels."

The school setting is unique in that there are numerous sources of RFR as detailed in the above table. Each child's exposure is a combination of whole body exposures from antennas at a

distance and more intense localized exposures from devices used close to the body. Birks et al., 2020 is the first large scale study of RF dose to the brain and body of children and adolescents and found that 2G cell phone calls are the main determinants of brain dose, especially in temporal and frontal lobes, whereas laptop and tablet use were the main determinants for whole-body doses.

OHA did not make any attempts to actually measure RFR exposures in Oregon schools.

The following questions need to be answered:

- How many schools in Oregon have Wi-Fi networks? How many hours a day are children using Wi-Fi devices in the classroom? Do kindergarteners use Wi-Fi devices in Oregon schools? Are tablets used on laps or on tables? Do students typically use wireless accessories like a wireless headphone, keyboard and mouse?
- What are policies related to personal devices like smartphones? Do children carry cell phones in their pockets in schools? How many schools have classes where cellphones are employed as a teaching tool? How many students use Airpods with cell phones in schools?
- How many schools use virtual reality with smartphones? For how many hours a month and in what grades?
- How many schools have cell towers on their property or in close proximity? Have RFR measurements been done in classrooms and on school property?

All of these questions (and more) would help characterize school RFR exposures. Measurement data could establish reference levels to understand if RFR increases or decreases in the future.

The answers to these questions are unknown because OHA did not include any data collection on actual RFR exposures in their investigation.

OHA could have engaged the Oregon Department of Environmental Quality to do measurements and collect this data. Oregon does take measurements of various environmental exposures. Oregon Tracking collects data about PM 2.5 and ozone but not RFR. Oregon maintains data on childhood blood lead testing but not RFR?

"Mobile Phone Infrastructure Regulation in Europe: Scientific Challenges and Human Rights Protection", a 2014 publication in Environmental Science & Policy by human rights experts argue that cell tower placement is a human rights issue for children because "the protection of children is a high threshold norm in Human Right law and the binding language of the Convention on the Rights of the Child obliges States Parties to provide a higher standard of protection for children than adults" and "any widespread or systematic form of environmental pollution that poses a long-term threat to a child's rights to life,

development or health may constitute an international human rights violation." The article concludes that the "dearth of legislation to regulate the installation of base stations (cell towers) in close proximity to children's facilities and schools clearly constitutes a human rights concern…" (Roda & Perry, 2014).

OHA had no research, measurements nor technical presentation of data on childrens' school exposures.

OHA omitted research on how new and *future technologies* such as 5G will increase RFR exposures in the classroom.

OHA omitted research on how new technologies such as 5G will increase RFR exposures in the classroom. OHAs report will be used as proof of no harm as new wireless technologies are brought into Oregon's classroom yet OHA does not put forward the critical research published on new technology such as 5G.

Industry is making a use case for 5G in the classroom. Verizon has a section on their website about 5G use cases because "educators from K-12 to Higher Education are looking for more effective, engaging ways to educate students". Wireless technology is being marketed for education at a rapid pace. Furthermore 5G antennas will be built near schools increasing the RFR on school property.

5G research should be included in any report on RFR in the classroom:

- El-Hajj and Naous 2020 concludes, "the deployment of 5G is expected to increase power density levels drastically."
- Kostoff et al., 2020 concludes "5G mobile networking technology will affect not only the skin and eyes, but will have adverse systemic effects as well."
- Russell, 2018 concludes that "a moratorium on the deployment of 5G is warranted" and "the addition of this added high frequency 5G radiation to an already complex mix of lower frequencies, will contribute to a negative public health outcome … from both physical and mental health perspectives"
- Di Ciaula 2018 concludes, "available findings seem sufficient to demonstrate the existence of biomedical effects, to invoke the precautionary principle."
- Yakymenko et al 2020 puts forward three mechanisms of harm from 5G including that the "absorption of 5G radiation in skin can lead to the generation of high levels of free radicals, which in turn increases the risk of skin cancer."
- Leszczynski 2020 review on the research on millimeter waves frequencies and skin concludes "the sufficient research has not been done and, therefore, precautionary measures should be considered for the deployment of the 5G, before the sufficient number of quality research studies will be executed and health risk, or lack of it, scientifically established."

- Belyaev 2019 states, "the health effects of chronic MMW exposures may be more significant than for any other frequency range..It follows from available studies that MMW, under specific conditions of exposure at very low intensities below the ICNIRP guidelines, can affect biological systems and human health."

5G will use millimeter waves untested for long term safety.
Dariusz Leszczynski PhD who published "Physiological effects of millimeter-waves on skin and skin cells: an overview of the to-date published studies (2020)" stated:

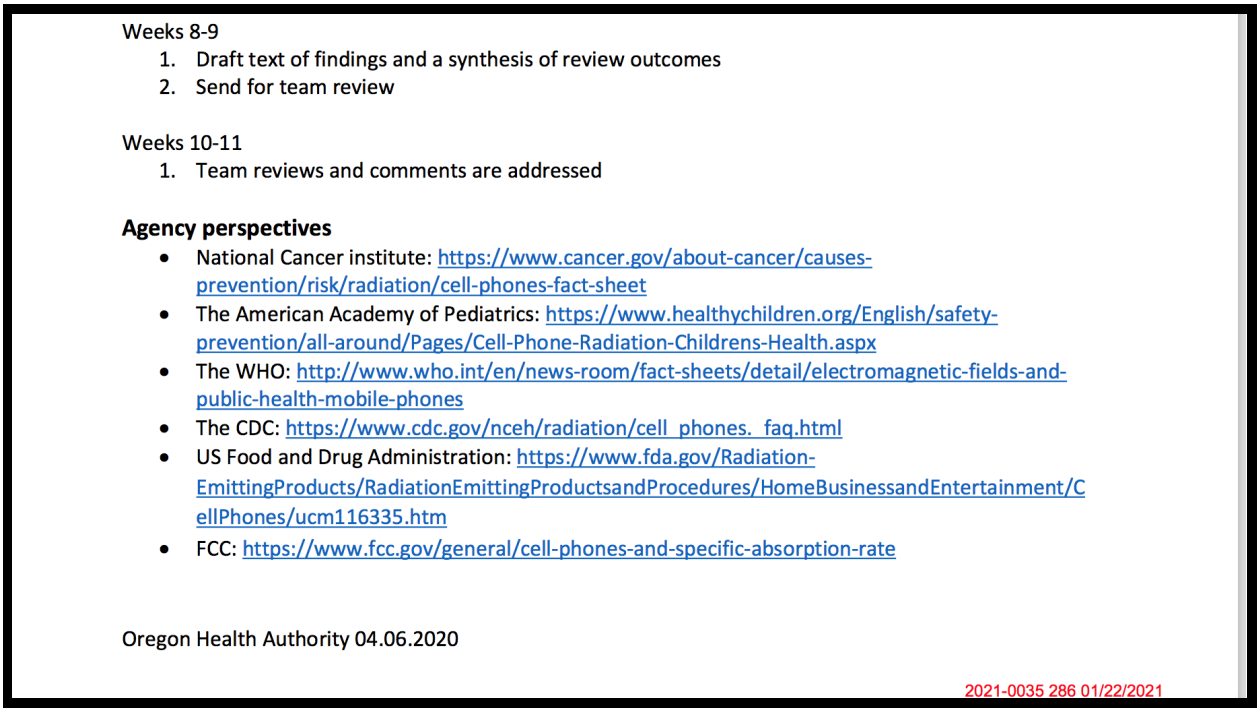
> *"As I presented in recent **review of science**, the whole scientific evidence on the possible effects of mm-waves on skin and skin cells consists of only some 99 studies, where 11 are human volunteer studies, 54 are animal in vivo studies (rats & mice) and 34 are in vitro laboratory studies using human and animal cell cultures. These studies examined only short-term acute effects of the exposure that do not provide any information about the possible delayed or long-term-exposure effects. Furthermore, the effects of mm-waves were examined in separation from other frequencies used by 5G and in separation from other environmental stressors (chemicals and radiations). Possibility of any co-effects and/or synergistic effects were not yet examined at all."*

The OHA circulated the American Academy of Pediatrics recommendations to reduce wireless exposure but then omitted the AAP recommendations from their FAQs and public resources.

PIAs show when OHA first developed their "Action Plan Draft" for the Wireless report in April 2020 OHA circulated a link with the American Academy of Pediatrics (AAP) 10 Tips to Reduce Cell Phone Radiation. The AAP is the largest group of US pediatricians. The OHA had a list of "Agency Perspectives" which included the AAP along with the CDC, FCC and FDA.

However the AAP recommendations are not listed in the final OHA report and in the OHA FAQS all the agencies cited are posted ***except the AAP.***

See an image below from the PIA OHA emails from April 2020.



Weeks 8-9

1. Draft text of findings and a synthesis of review outcomes
2. Send for team review

Weeks 10-11

1. Team reviews and comments are addressed

Agency perspectives

- National Cancer institute: https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones-fact-sheet
- The American Academy of Pediatrics: https://www.healthychildren.org/English/safety-prevention/all-around/Pages/Cell-Phone-Radiation-Childrens-Health.aspx
- The WHO: http://www.who.int/en/news-room/fact-sheets/detail/electromagnetic-fields-and-public-health-mobile-phones
- The CDC: https://www.cdc.gov/nceh/radiation/cell_phones._faq.html
- US Food and Drug Administration: https://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones/ucm116335.htm
- FCC: https://www.fcc.gov/general/cell-phones-and-specific-absorption-rate

Oregon Health Authority 04.06.2020

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The American Academy of Pediatrics (AAP) recommends ten steps for families to reduce RFR exposure including:

- The AAP recommends, "Avoid carrying your phone against the body like in a pocket, sock, or bra. Cell phone manufacturers can't guarantee that the amount of radiation you're absorbing will be at a safe level," yet children in schools are carrying transmitting cell phones in their pockets, bras or tucked into tight clothing directly against their skin.
- The AAP also recommends, "If you plan to watch a movie on your device, download it first, then switch to airplane mode while you watch in order to avoid unnecessary radiation exposure," yet children are streaming videos with Wi-Fi on tablets and laptops in schools.
- In *Pediatric Environmental Health, 3rd Edition,* the AAP recommends, "exposures can be reduced by encouraging children to use text messaging when possible, make only short and essential calls on cellular phones, use handsfree kits and wired headsets and maintain the cellular phone an inch or more away from the head."
- The AAP also states of cell towers that, "An Egyptian study confirmed concerns that living nearby mobile phone base stations increased the risk for developing: headaches, memory problems, dizziness, depression, sleep problems. Short-term exposure to these fields in experimental studies have not always shown negative effects, but this does not rule out cumulative damage from these fields, so larger studies over longer periods are

needed to help understand who is at risk. In large studies, an association has been observed between symptoms and exposure to these fields in the everyday environment."

The OHA omits the positions of US public health and medical organizations.

There are numerous public health and medical organizations recommending that exposure to radiofrequency be reduced. The California Department of Public Health (CDPH) recommends reducing RFR exposures to children. "Children's brains develop through the teenage years and may be more affected by cell phone use," said Dr. Smith of the CDPH, "Parents should consider reducing the time their children use cell phones and encourage them to turn the devices off at night."

The North Carolina Public Health Department of Occupational & Environmental Epidemiology lists the AAP recommendations citing the WHO/IARC classification as well as clear evidence of cancer found in the NTP study. The Connecticut Department of Health recommends reducing wireless exposures to the brain, stating "It is wise to reduce your exposure to radiofrequency energy from cell phones whenever possible."

Why did OHA omit these expert recommendations?

Worldwide Public Health Recommendations

Medical organizations that have issued recommendations to reduce exposure worldwide include: ANSES, France's National Agency for Food, Environmental and Occupational Health Safety, Turin Medical Association of Italy, The American Academy of Environmental Medicine, Swiss Physicians Association of Doctors for Environmental Protection, African Cancer Organisation, The Cyprus National Committee on Environment and Child Health, Austrian Medical Association and Athens Medical Association.

Published papers document how to reduce radiofrequency radiation in schools.

The school measurement study by Hedendahl et al., 2017 concludes that in order to reduce children's exposure to RF radiation, "schools should prefer wired network connections, allow laptop, tablets, and mobile phone usage only in airplane mode and deactivate Wi-Fi access points when internet is not needed for learning purposes."

Hedendahl et al., 2017 Table 10 | The following actions are examples of methods to reduce children's exposure to RF radiation in schools:

1. Wired connection to both teachers' and students' devices, and no wireless networks or devices in school is the optimal choice. If this is not possible:
2. Wired connection to each classroom
    a. to the teacher's laptop,
    b. for the students to download large files and videos.
3. To reduce exposure from Wi-Fi networks in school:
    a. turn off Wi-Fi access points when not used for learning purposes,
    b. position Wi-Fi access points outside of classrooms,
    c. use directional Wi-Fi access points, which radiate into the direction of the client's device.
4. Keep laptops and tablets in flight mode when Internet is not needed for learning purposes.
5. Wired connection to a landline telephone in each classroom could minimize the need for mobile phones for contact.
6. Mobile phones, including smart phones, could be left at home or collected in turned off mode. If allowed, they should be carried only in flight mode during school hours.

A 2019 publication "Building Science and Radiofrequency Radiation:What Makes Smart and Healthy Buildings" in the industry journal Building and Environment summarizes the scientific evidence showing harmful effects at low levels- well below government limits and the paper details best practices in buildings to reduce radiofrequency as including wired technology instead of Wi-Fi, and corded phones in buildings (Clegg 2019).

"Building Science and Radiofrequency Radiation:What Makes Smart and Healthy Buildings"
7.1. Regional U.S. Guidelines and recommendations to limit RFR exposure in schools
In addition to national policies to reduce children's EMF exposures, several authorities in the U.S. have issued guidelines for schools.

In 2014, the Collaborative for High Performance Schools (CHPS) [189], the leading organization for healthy schools in the U.S., first published recommendations to minimize exposure to both Extremely Low Frequency (ELF) magnetic fields and RFR. Criteria for "Low-EMF Best Practices" include:

- providing a wired local area network (LAN) for Internet access throughout the school;
- disabling all wireless transmitters on all devices;
- ensuring that all laptops or notebooks have an Ethernet port and a single physical switch to disable all wireless radios;
- providing easily accessible hard-wired phones for teacher and student use;

- prohibiting the installation or use of DECT cordless phones; and
- prohibiting the use of cell phones and other personal electronic devices in instructional areas.

The OHA conclusion that there is insufficient evidence that RFR causes cancer or other health effects is inaccurate due to the flawed design of the investigation into the evidence.

The OHA summary is an inaccurate summary of the state of science and is a dangerous and misleading report as it creates the illusion that exposure to wireless radiation is safe...even for the most vulnerable among us, our children.

Page 4 states, "OHA found insufficient evidence to indicate a causal relationship between cell phone exposures and cancer endpoints." As described above, this is the opposite of the conclusion of IARC, the global leading authority on determination of carcinogenicity.

The OHA conclusion is erroneous due to, 1) the flawed design of the OHA literature review that omits animal and cellular data, 2) the omission of important human studies, and 3) an unsophisticated characterization of the human data.

OHAs conclusions are contrary to the conclusions of numerous scientific publications that have looked at various endpoints in the literature such as:

- Prasad et al., 2017, a meta-analysis of 14 case-control studies showed that for mobile phone use of 10 years or longer (or >1640 h), the overall result of the meta-analysis showed a significant 1.33 times increase in risk and " Studies with higher quality showed a trend towards high risk of brain tumour, while lower quality showed a trend towards lower risk/protection."
- Peleg et al., 2018 which concludes, "Overall, the epidemiological studies on excess risk for HL and other cancers together with brain tumors in cellphone users and experimental studies on RFR and carcinogenicity make a coherent case for a cause-effect relationship and classifying RFR exposure as a human carcinogen (IARC group 1)."
- Miller et. al., 2018 which concludes "When considered with recent animal experimental evidence, the recent epidemiological studies strengthen and support the conclusion that RFR should be categorized as carcinogenic to humans (IARC Group 1)."
- A 2017 literature review (Kostoff and Lau. 2017) published in Microwave Effects on DNA and Proteins found there is "substantial credible scientific evidence" supporting

not only tumor promotion but also enhanced cellular or genetic mutations, and teratogenicity from nonionizing radiation.

- Lai 2021 which reviews genetic effects and states, "Thus, it is safe to conclude that genotoxic effects of EMF have been reported. The most common effects found are: DNA strand breaks, micronucleus formation, and chromosomal structural changes...There are similarly many studies that showed changes in gene expression after EMF exposure (Supplement 3). Changes in expression of many different genes have been reported. Studies in gene expression by static/ELF-EMF are far more diversified than those of RFR. The most interesting results are the expression of genes related to stress response both in vitro and in vivo in plants and animals. Another important finding is the expression of heat shock proteins, particularly HSP70, which is an important protein involved in protein misfolding and protecting cells from environmental stress....EMF also interacts synergistically with different entities on genetic functions. Interactions, particularly with chemotherapeutic compounds, raise the possibility of using EMF as an adjuvant for cancer treatment to increase the efficacy and decrease side effects of traditional chemotherapeutic drugs. Other data, such as adaptive effects and mitotic spindle aberrations after EMF exposure, further support the notion that EMF causes genetic effects in living organisms."
- Hardell and Carlberg 2019 conclude, " there is clear evidence that RF radiation is a human carcinogen, causing glioma and vestibular schwannoma (acoustic neuroma). There is some evidence of an increased risk of developing thyroid cancer, and clear evidence that RF radiation is a multi‑site carcinogen. Based on the Preamble to the IARC Monographs, RF radiation should be classified as carcinogenic to humans, Group 1."

Review by Christopher Portier PhD former Director of the United States National Center for Environmental Health at the Centers for Disease Control and Prevention and the Director of the Agency for Toxic Substances and Disease Registry

Christopher Portier PhD, a longtime US government scientist now retired, submitted a comprehensive review of the scientific research in a major cell phone/brain cancer lawsuit where he concludes that "The evidence on an association between cellular phone use and the risk of glioma in adults is quite strong" and "In my opinion, RF exposure probably causes gliomas and neuromas and, given the human, animal and experimental evidence, I assert that, to a reasonable degree of scientific certainty, the probability that RF exposure causes gliomas and neuromas is high."

The 176-page expert report with 443 references was prepared for the plaintiffs in a major product liability lawsuit, Murray et al. v Motorola, Inc. et al., filed in the Superior Court for the District of Columbia against the telecommunications industry. The plaintiffs in the case are suing the telecommunications industry for damages because they developed brain cancer after years of using a cell phone by holding it up to their head. Most of the plaintiffs have passed away. Court dates are set for Murray et al. v. Motorola July 12-23, 2021.

Chris Portier PhD was the Director of the United States National Center for Environmental Health at the Centers for Disease Control and Prevention in Atlanta, and the Director of the Agency for Toxic Substances and Disease Registry. Prior to the CDC, Dr. Portier was with the National Institute of Environmental Health Sciences for 32 years where he served as the NIEHS Associate Director, Director of the Environmental Toxicology Program, and Associate Director of the National Toxicology Program.

He is one of many US governments scientists issuing expert opinions on the scientific evidence showing harm.

The Oregon Health Authority (OHA) Report has a flawed design that limits the scope of research to specific human studies. This invalidates any conclusions of no health effects. The omission of all animal studies has the effect of minimizing and concealing the risks of harm by eliminating the consideration of carefully controlled studies designed to investigate biological effects.

Experimental studies are carried out in order to predict and prevent human harm. Instead, the report effectively asked whether there is *current* proof of human harm.

That is the wrong question, as remarks below make clear. The responsibility for public health authorities is to ***prevent harm, not prove whether harm has already happened.*** By limiting the review solely to studies of human impacts, effectively ignoring hundreds of animal studies designed to investigate RFR effects, this report provides an inadequate, incomplete and misleading compilation of evidence, neglecting the substantial body of evidence that exists.

"*The failure of the Oregon Health Authority to consider the substantial body of evidence showing harm to animals is an outrageous betrayal of public health principles. The National Academy of Sciences, World Health Organization and U.S. public health agencies have a long tradition of relying on animal toxicology/carcinogenicity studies to identify hazardous agents and assess health risks in order to implement public health protective policies to prevent human harm. The Oregon Health Authority has utterly failed to protect public health*," stated Devra Davis, PhD, President of Environmental Health Trust and founding director of the Board on Environmental Studies and Toxicology of the U.S. National Research Council, National Academy of Sciences.

The OHA summary is an inaccurate and misleading report as it creates the illusion that exposure to wireless radiation is safe...even for the most vulnerable among us, our children.

Dr. Samet, senior scientist and chair of the World Health Organization's International Agency for the Research on Cancer 2011 RF-EMF Working Group stated, "The IARC 2B classification implies an assurance of safety that cannot be offered—a particular concern, given the prospect that most of the world's population will have lifelong exposure to radiofrequency electromagnetic fields," in his 2014 Commentary calling for more directed research published in the journal *Epidemiology (Samet 2014)*.

V. The OHA Report has scientific errors, misrepresentations, omissions and unqualified conclusions.

The OHA report conclusion misrepresents the policy positions and research of federal agencies in the USA.

The OHA report executive summary page 5 states that OHA's conclusions are "in line with conclusions by the U.S. Food & Drug Administration, the Centers for Disease Control and Prevention, the National Cancer Institute and other agencies that work to protect population health." OHA's statement would likely result in the reader erroneously thinking that federal health agencies have researched the issue and concluded there is no scientific evidence. This is an inaccurate assumption. ***Fact: No US federal public health, environmental or research agency has reviewed the current full body of science on radiofrequency radiation for health effects. None.***

OHA's statement uses footnotes 114 through 116 to substantiate their statement. These footnotes link to web pages, not research reviews, nor safety evaluations. A look at the 3 OHA footnotes (see details below) confirms that there is no US health agency -- not the FDA, not the EPA, not the National Cancer Institute, not the CDC, nor any other federal health or safety agency -- that has ever reviewed the full body of research on the health effects of wireless radiation in the last three decades. There was no pre-market safety testing before cell phones or Wi-Fi came on the market. There also is no post-market surveillance. The EPA was fully defunded from setting proper safety limits in 1996, despite being tasked to do so, and in 1996 the federal government adopted 'safety limits' created by groups dominated by industry. These limits did not consider long-term exposure, and they didn't incorporate research on health effects to children whose brains are developing. Yet despite over a thousand studies showing harm from no heating effects, FCC wireless radiation limits have not changed since 1996. This is why the Environmental Health Trust filed legal action against the FCC which erroneously decided to maintain their 1996 human exposure limits.

Documentation on OHA Footnotes 114 - 116 Revealing No Research Review

The U.S. Food & Drug Administration (FDA)
OHA references the FDA website OHA citation 114 "Food and Drug Administration (FDA). Scientific Evidence for Cell Phone Safety [Internet]. 2020. Available from: https://www.fda.gov/radiation-emitting-products/ cell-phones/scientific-evidence-cell-phone-safety"

The OHA citation links to the FDA website, majorly updated on February 10, 2020. Although the FDA webpages on cell phones seem to indicate safety, the indisputable fact is that the FDA has not reviewed the full body of research as clearly shown when you consider the documentation provided by the FDA.

- **Cancer and tumors only:** The FDA report cited as documentation is entitled "Review of Published Literature between 2008 and 2018 of Relevance to Radiofrequency Radiation and Cancer, and *this report is only about cancer- not for example -brain damage, oxidative stress or reproductive damage*. It is not a systematic review of all the research evidence. Furthermore, it is focused on cancer from cell phones, not Wi-Fi. The FDA literature Review states, "here were two main foci for the review: i) epidemiological evidence for the existence of any tumor risk from cell phone usage, and ii) *in vivo* (animal) studies assessing any causality of tumorigenesis from of RFR exposure."
- **Animal cancer findings dismissed:** Notably, the FDA dismisses the NTP and Ramazzinni study findings as relevant to humans (as OHA also has done) despite the fact that the FDA asked the NTP to do the cell phone radiation animal study.
- **FDA Review criticized by experts**: The FDA webpage update did not go unnoticed. Numerous scientists including several now retired US government scientists - are calling for the FDA to retract the review as it offers unsubstantiated assurance of safety (EHT 2020). They asked questions and penned a letter to the FDA with several individual statements. So far the FDA has not responded to the specific questions.
  Letters which have been sent to the FDA include:
  - Letter calling for a retraction signed by several scientists.
  - Ronald Melnick PhD's letter to the FDA
  - Albert Manville PhD, retired Senior Wildlife Biologist, Division of Migratory Bird Management, U.S. Fish & Wildlife Service, Wash. DC HQ Office (17 years); Senior Lecturer, Johns Hopkins University
  - Prof. Tom Butler of the University College in Cork, Ireland's letter to the FDA
  - Igor Belyaev, PhD, Dr. Sc. Head, Department of Radiobiology of the Cancer Research Institute, Biomedical Research Center of the Slovak Academy of Science letter to the FDA
  - Paul Heroux PhD, McGill University
  - Alfonso Balmori, BSc statement to the FDA
  - PDF of all letters and statements.

Dr. Ronald Melnick, a 28 year NIH scientist wrote to the FDA:

"I am writing this letter to detail major incorrect statements and omissions of relevant data in the FDAdocument titled "Review of Published Literature between 2008 and 2018 of Relevance toRadiofrequency Radiation and Cancer." I led the design of the National Toxicology Program's (NTP) toxicity and carcinogenicity studies on cell phone radiation and I strongly believe that the anonymously written FDA document misrepresents the utility of the NTP study for assessing human health risks. In addition, the report's casual dismissal of both the mechanistic findings and the numerous results from epidemiological studies that have shown increased cancer risks

associated with exposure to radiofrequency radiation (RFR) are inconsistent with the FDA's stated core mission "to protect and promote the public health."

"The dismissal of the NTP study results by the FDA is rather peculiar since it was the FDA's Center for Device andRadiological Health that requested the toxicity and carcinogenicity of RFR in experimental animals (CDRH nomination of RFR) "to provide the basis to assess the risk to human health," and FDAscientists were fully aware of the exposure methodology that was used in the NTP study long before those studies were begun."

- **Confirmation by the GAO:** The Government Accountability Report on 5G (GAO 2020) confirmed the fact that the FDA review was very selective stating that the FDA and other organizations "only reviewed a subset of the relevant research" and "The assessment focused on cancer-related animal and human studies of frequencies below 6 GHz."

Federal Appeals Court Judges: In the January 25, 2021 oral arguments for EHT et al v. the FCC (Transcript) the judges asked pointed questions of the FCC about how in 2019, they determined to maintain the 1996 adopted guidelines. The FCC, like OHA, referred back to the FDA as substantiating their safety determination. However the judges pointed out that the FDA did not show documentation of a comprehensive review outside of a narrow scope related to cell phones and cancer.

Here are some quotes by the judges:

- **Minute 26.17** There's so many new devices, and people are using multiple devices...The FDA came back and talked about cellphones and cancer. How was that reasonable for the FCC to rely so heavily on a response from the FDA that there's no indication relied on this specialized Committee and did not address the very things you asked for information on: other devices, the use of multiple devices, and physical harms other than cancer?" Listen
- **Minute 28.29**: The Honorable Patricia Ann Millet states, "People don't use their phones... hardly use them for phone calls anymore. They are constantly in the hand— not two centimeters away, they're constantly in the hand. And the fingers are constantly on them.And so I'm just trying to understand how the FDA coming back and talking about cellphones that are in a holster—where nobody keeps them anymore—or in a purse when they're not being used is at all... and looking only at cancer is at all relevant to an Inquiry, again, into the effect of this radiation frequency from multiple devices that are used in entirely different ways now, in entirely different volume, and throughout the population, including children who live on iPads." Listen
- Minute 35:02 The FCC says, "we said repeatedly that there was no evidence of any effect—not just cancer, any illness—from, ah, radiofrequency emissions below our existing levels," and the Honorable Patricia Ann Millet asks the FCC "Sorry, can you point me to that paragraph where it said... where it was addressing cumulative impacts?"

and the FCC attorney refers to "scientific conclusions" and "the scientific studies that the FDA and others have looked at," at which time the judge states, "No, the FDA didn't. The FDA was only talking about cellphones. That's my point." Listen

As the FDA literature review cited by OHA shows, the FDA has not expanded its consideration outside of the issue of the issue of cancer as discussed in the oral argument for EHT et al., v the FCC.

The Centers for Disease Control and Prevention (CDC)

OHA references the CDC website OHA citation 115. "Centers for Disease Control and Prevention (CDC). Frequently Asked Questions about Cell Phones and Your Health [Internet]. 2014. Available from: https://www.cdc.gov/nceh/ radiation/cell_phones._faq.html"

- **No research review:** The OHA report only cites the webpage of the CDC but does not cite a scientific reference for the CDC because there is no research review or report with conclusions by the CDC to cite. The CDC has never done a scientific research review on this issue. There are no reports, no reviews and no documentation that exists showing the CDC did any research review to determine safety of health effects.
- **Warnings removed:** In June 2014 the CDC posted cautionary text about cell phones and health (See the CDC text here). The CDC stated at that time, *"along with many organizations worldwide, we recommend caution in cell phone use. More research is needed before we know for sure if using cell phones causes cancer."* This text was removed weeks later. Microwave News and a New York Times January 1, 2016 exposé details how CDC officials retracted these warnings about cell phone radiation.
- **Industry tied scientist group told the CDC to remove cautionary text.** EHT posted 500+ internal CDC emails, obtained as part of our FOIA request, detailing how - in fact- scientists known to have received money from the cell phone industry, sent emails to the CDC directing changes in the CDC website content stating, "Changes are truly needed."
    - See also Microwave News "NCRP Pressured CDC To Remove Cell Phone Safety Advice: You Say "Caution," We Say "Precaution," Let's Call the Whole Thing Off".

- **Deleted Information on Children:** The CDC also deleted text on children's vulnerability. On August 18, 2014, the bulk of sentences cautioning the public of the greater risk to children from phone radiation were removed because—according to what CDC officials state in the emails—"We thought the struck language was hard to understand." (page 397 of internal documents). Although most statements about children were removed in August 2014, the

question about children was fully removed by January 2016.

BEFORE

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Radiation and Your Health

Fre[illegible] Asked Questions about Cell Phones and Your Health

Most of us depend on cell phones every day. Some people wonder if cell phones can cause health problems. Here's what you should know about cell phones and your health.

Can using a cell phone cause cancer?

There is no scientific evidence that provides a definite answer to that question. Along with many organizations worldwide, we recommend caution in cell phone use. More research is needed before we know for sure if using cell phones causes cancer.

Do cell phones give off (emit) radiation?

Yes – cell phones and cordless phones use radio frequency radiation (RF) to send signals. RF is different from other types of radiation (like x-rays) that we know can be harmful. We don't know for sure if RF radiation from cell phones can cause health problems years later. The International Agency for Research on Cancer (IARC) has classified RF radiation as a "possible human carcinogen." (A carcinogen is an agent that causes cancer.)

Should people stop using cell phones?

Scientific studies are ongoing. Someday cell phones may be found to cause health problems we are not aware of at this time. However it is also important to consider the benefits of cell phones. They can be valuable in an urgent or emergency situation– and even save lives.

If you are worried about cell phone use, follow the tips below.

Cell phone tips

To reduce radio frequency radiation near your body:

- Get a hands free headset that connects directly to your phone.
- Use speakerphone more often.
- If you have a pacemaker, keep the phone at least 8 inches away from it.

Do cell phones cause health problems in children?

It's too soon to know for sure. Children who use cell phones – and continue to use them as they get older – are likely to be around RF for many years. If RF does cause health problems, kids who use cell phones may have a higher chance of developing these problems in the future.

What research is being done to learn more about cell phones and health?

Scientists are continuing to study the possible health effects of cell phone use. For example, the World Health Organization (WHO) is currently looking into how cell phones may affect:

- Some types of tumors (a lump or growth)
- Our eyes
- Sleep
- Memory
- Headaches

In the News: Acoustic Neuroma

Scientists are looking into a possible link between cell phone use and certain types of tumor. One type is called an acoustic neuroma ("ah-COOS-tik nur-OH-ma"). This type of tumor grows on the nerve that connects the ear to the brain. It doesn't cause cancer, but it may lead to other health problems, like hearing loss. Another type scientists are looking into is called a glioma ("glee-OH-ma"). This is a tumor found in the brain or central nervous system of the body.

Where can I get more information about cell phones and health?

For more information, visit: The Federal Communications Commission (http://www.fcc.gov/cgb/cellular.html) (http://www.cdc.gov/Other/disclaimer.html) World Health Organization (http://www.who.int/mediacentre/factsheets/fs193/en) (http://www.cdc.gov/Other/disclaimer.html) The Food and Drug Administration (http://www.fda.gov/Radiation-EmittingProducts

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Should people stop using cell phones?

~~Scientific studies are ongoing. Someday cell phones may be found to cause health problems we are not aware of at this time.~~ *(Add)*- At this time we do not have the science to link health problems with cell phone use. Scientific studies are underway to determine whether cell phones may cause health effects. However it is also important to consider the benefits of cell phones. They can be valuable in an urgent or emergency situation– and even save lives.

If you are worried about cell phone use, follow the tips below.

Cell phone tips

To reduce radio frequency radiation near your body:

- Get a hands free headset that connects directly to your phone.
- Use speakerphone more often.
- ~~If you have a pacemaker, keep the phone at least 8 inches away from it.~~ (Add) In the past, RF interfered with the operation of some pacemakers. If you have a pacemaker and are concerned about how your cell phone use may affect it, contact your health care provider.

~~Do cell phones cause health problems in children?~~

~~It's too soon to know for sure. Children who use cell phones – and continue to use them as they get older – are likely to be around RF for many years. If RF does cause health problems, kids who use cell phones may have a higher chance of developing these problems in the future.~~

What research is being done to learn more about cell phones and health?

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Where can I get more information about cell phones and health?

For more information, visit: The Federal Communications Commission (http://www.fcc.gov/cgb/cellular.html) (http://www.cdc.gov/Other/disclaimer.html) World Health Organization (http://www.who.int/mediacentre/factsheets/fs193/en) (http://www.cdc.gov/Other/disclaimer.html) The Food and Drug Administration (http://www.fda.gov/Radiation-EmittingProducts /RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones /ucm116282.htm) (http://www.cdc.gov/Other/disclaimer.html)

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

USA.gov

- **Industry tied consultation:** If you go to the CDC website you might think they have done a review as the CDC website seems to indicate experts reviewed the research. In fact, in 2014, the CDC hired an industry consultant to draft and provide subject matter expertise to several web pages related to radiofrequency radiation as detailed in a recent investigation Wireless Hazards by journalist Barbara Koeppel published in the Washington Spectator. Two of the web pages that the consultant (known to receive money from industry) worked on with the CDC were posted (Wearable Technology and Non-Ionizing Radiation) and three were not ever posted (Wireless Networks -Click here to see a CDC draft never published; Power Lines and Electromagnetic Hypersensitivity- Click here to see a CDC draft never published)
- **Outdated:** The CDC webpage OHA cites was last updated in 2014 well before the NTP study and studies were published.

The National Cancer Institute (NCI)

The OHA cites the web pages 116. "National Cancer Institute (NCI). Cell Phones and Cancer Risk [Internet]. 2019. Available from: https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones-fact-sheet#r14" as if NCI had an opinion based on a comprehensive research review.

However the fact is that the NCI also has never done a scientific research review to determine the safety of RFR to the public. They have not done any published systematic review nor issued any written reports on the matter in the last few decades. Even if scientists had an opinion, they *only are focused on cancer*, but do not investigate the brain damaging effects or the reproductive damaging effects. NCI has confirmed this repeatedly. Documentation includes:

- **New Hampshire 5G Commission letter**: The NCI confirmed that they have not issued an opinion nor evaluated the safety of RFR in a 2020 letter to New Hampshire 5G Commission Member Denise Ricciardi stating, "*NCI does not make recommendations or issue guidelines... The FDA and FCC are the responsible federal agencies with authority to issue opinions on the safety of these exposures. As a Federal research agency, the NCI is not involved in the regulation of radiofrequency telecommunications infrastructure and devices, nor do we make recommendations for policies related to this technology."* (NCI 2020 Letter)
- **Letter to Scarato:** The NCI also confirmed this fact in a 2016 letter to EHT's Executive Director Theodora Scarato, as well stating that, *"Neither the literature reviews, nor the fact sheets, make safety determinations."* (Letter from NCI to Scarato, PDF of Communications)

Other US Agencies
The OHA references "other agencies" but if such findings exist then where are they?

The Environmental Protection Agency (EPA) has not done a research review since 1984.
The EPA has not released any report nor done any review on RFR or EMF since 1984 and has no current funded mandate to research the issue. The EPA confirmed all of these facts in a 2020 letter to EHT Director Theodora Scarato.

- Previous to 1996 the EPA conducted robust research on electromagnetic radiation (EPA Letter) and was in development of safety limits for wireless radiation (See EPA Briefing) but just as they were poised to issue these recommendations, the EPA lost all of their research funding and has no funded mandate to do any research since then (See 2020 EPA letter). See EPA reports going back decades here. See a1995 EPA Letter to the FCC on their near completion of EMF Guidelines
- Regarding FCC limits, the EPA has officially stated that the 1996 human exposure limits adopted by the FCC were not set to protect against long term exposures, nor did they incorporate scientific understanding of impacts to children. A 2002 letter from Norbert Hankin,of the Radiation Protection Division of the EPA stated, "I believe that it is correct to say that there is uncertainty about whether or not current guidelines adequately treat nonthermal, prolonged exposures (exposures that may continue on an intermittent basis for many years)…Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, nonthermal exposures. When developing exposure standards for other physical agents such as toxic substances, health risk uncertainties, with emphasis given to sensitive populations, are often considered. Incorporating information on exposure scenarios involving repeated short duration/nonthermal exposures that may continue over very long periods of time (years), with an exposed population that includes children, the elderly, and people with various debilitating physical and medical conditions, could be beneficial in delineating appropriate protective exposure guidelines."
- See 1993 EPA Comments to the Federal Communication Commission's (FCC's) proposed RF/MW radiation limits 93-142 Guidelines For Evaluating the Non Thermal Effects of Radiofrequency Radiation: The EPA states that certain subgroups are more at risk (pregnant women, children and the elderly) and calls for an updated, comprehensive review that considers the biological effects of RF, specifically pointing to the need to update the NCRP Report 86 (Note: NCRP 86 is still the basis for US regulations according to the FCC and has not been updated to include biological effects). "The FCC should not adopt the 1992 ANSI IEEE standard; there are serious flaws in the standard that call into question whether the proposed use of the 1992 ANSI IEEE is sufficiently protective." The report also states that "the claim of protection for all persons from all interactive mechanisms" has "not been supported". Read the letter and comments here.
- Read the 1984 US Science Advisory Board (SAB) Recommendation to the EPA To Develop RF Guidelines providing more documentation of how the EPA was tasked to develop safety limits, and was later defunded.

Why didn't OHA present the findings and policy of other US government agencies such as the National Institutes of Environmental Health that do- in fact- share science showing harm?

National Toxicology Program (NTP)

- The NTP website details how the "NTP conducted two-year toxicology studies in rats and mice to help clarify potential health hazards, including cancer risk, from exposure to RFR" and found clear evidence of cancer, DNA damage. NTP Website

National Institutes of Environmental Health (NIEHS)

- The NIEHS website details the NTP findings of clear evidence of cancer and DNA damage from RFR exposure and state "the final conclusions represent the consensus between NTP and a panel of external scientific experts who thoroughly reviewed the NTP draft technical reports at a public meeting in March 2018." NIEHS Website OHA did not cite this webpage nor research study. Why not?

National Institute of Occupational Safety and Health (NIOSH)

- The NIOSH Workplace Safety & Health Topic Electromagnetic Fields presents the International Agency for Research on Cancer (IARC): Non-Ionizing Radiation, Part 2 Radiofrequency Electromagnetic Fields IARC Monographs, Volume 102 (2013) stating "This highly-respected international program evaluated the carcinogenicity of RF fields, especially cell phones, as part of its program to evaluate all potential carcinogens." Yet OHA did not even reference the IARC evaluation.
- NIOSH also presents the NTP RFR animal study as "NIEHS research on possible health risks from cell phones, especially the ongoing animal cancer assay by the National Toxicology Program (NTP)." OHA did not cite this evaluation. Why not?

American Cancer Society Chief Medical Officer, Otis W. Brawley, M.D. on the NTP Study:

- "For years, the understanding of the potential risk of radiation from cell phones has been hampered by a lack of good science. This report from the National Toxicology Program (NTP) is good science.

  The NTP report linking radiofrequency radiation (RFR) to two types of cancer marks a paradigm shift in our understanding of radiation and cancer risk. This is a striking example of why serious study is so important in evaluating cancer risk. It's interesting to note that early studies on the link between lung cancer and smoking had similar resistance, since theoretical arguments at the time suggested that there could not be a link.

> "This new evidence will undoubtedly factor into ongoing assessments by regulators to determine the potential cancer risk posed by cell phones. The American Cancer Society eagerly awaits guidance from government agencies, like the U.S. Food and Drug Administration (FDA) and the Federal Communications Commission (FCC), about the safety of cell phone use.
>
> NTP staff were clearly aware of the potential importance of this study and went the extra distance to ensure the best science is used.They solicited review from multiple scientists from outside the NTP to critically review all aspects of the data analysis and study findings." May 27, 2016

Thus, OHAs statement that their review is "in line" with other public health agencies is not an accurate characterization of the reality of what other public health agencies have considered and determined. No US agency has looked at all the research, nor issued a report that reviewed the full body of research.

The OHA report downplays impacts to memory and the brain.

Neurological health effects resulting from non‑thermal RF exposures are clearly documented. The OHA report omitted key studies on neurological effects and downplayed the results of studies that did find effects.

The OHA Report's handling of the study Foerster et al. (2018) is a key example of downplaying the results of studies that did find effects. Foerster et al. (2018) is a study on over 700 teeenagers that found *statistically significant associations between cell phone use and memory damage in teens using cell phones to the head for one year.* The OHA report states, "Foerster et al. (2018) found associations between cell phone use and effects on figural memory in Swiss adolescent schoolchildren (81). *However, the statistically significant effects were small*."

First what does OHA mean by "small" in reference to memory impacts? The study data found a statistically significant association regarding a widespread environmental exposure. Even if the effect were "small" can OHA quantify how "small" would the impact be to Oregon's children? How many children? How many IQ points?

The effects of the toxic metal lead were downplayed as "small" for years. Now, decades later, public health officials agree there is no safe level of lead because impacts to the brain, no matter how "small" can have significant public health implications and "small" impacts to a child's developing brain can have large impacts later in life.

Secondly, EHT notes that Foerster et al. (2018) was a replication of a previous study Schoeni 2015 w*hich OHA neglected to include in their "review.*" Foerster et al. (2018) used twice the sample size of Schoeni 2015, including quantitative data from the Telecom companies and state of the art science to estimate the absorption of RF-EMF in adolescents' brains. Why was Schoeni 2015 omitted from the OHA review? Why was the fact that Foerster was a replication study omitted from the review?

Finally, the OHA report inaccurately criticized Foerster et al., 2018 study stating that, "there were very large differences between reported phone use and phone use records." Such a statement should have been immediately followed by the clarification that data records of quantitative phone use was then obtained from the mobile phone operators themselves and these subjects were part of what was termed the operator data sample. Changes in figural memory score were negatively correlated with cordless phone calls and, in tendency, with the duration of mobile phone calls and the cumulative RF-EMF brain dose. Thus OHA did not accurately present this study as the association with RF-EMF brain dose was significant in the operator data sample.

The OHA treatment of Foerster et al. (2018) and brain impacts is a prime example of the issues endemic to the OHA report which includes unscientific characterizations of research, unfounded criticisms, lack of attention to children's vulnerability and omitted science.

Research on animals (Bas et al., 2009; Deshmukh et al., 2015; Shahin et al., 2017;Megha et al., 2015; Aldad et al., 2012; Zhang et al., 2015) shows impacts from RFR to the brain such as alterations in neurodevelopment and behavior of offspring, impaired learning and spatial memory, a deleterious impact on hippocampal, pyramidal or cortical neurons and induced markers of oxidative stress and inflammation in the brain. There is human data consistent with these animal studies, as they have found higher cell phone radiation associated with behavioral problems and memory damage (Divan et al., 2012; Birks et al. 2017; Foerster et. al., 2018).

A research review on the biological effects of microwave radiation related to brain energy supply, mitochondrial energy metabolism and potential related mechanisms by the National Natural Science Foundation of China (Hao et al, 2015) states:

> "As the fourth largest source of pollution after air, water and noise, [microwave] MW radiation induces many biological effects. The brain is the most sensitive target organ for MW radiation, where mitochondrial injury occurs earlier and more severely than in other organs."
>
> "Research from our group and from others has demonstrated that microwave radiation damages hippocampal structures in rats, impairs long-term potentiation, decreases neurotransmitter concentrations, reduces synaptic vesicles in number and results in

memory impairment [5,18,19]. Thus, the brain is generally accepted as the most sensitive target organ for MW radiation.

The damaging effects of MW radiation on the brain include brain dysfunction and brain structural damage. An epidemiological survey found that MW radiation caused human fatigue, headache, excitement, dreams, memory loss and other symptoms of neurasthenia [20]. In addition, there were impaired learning and memory abilities in rats after MW radiation, as determined by the Morris water maze [5,6,21,22]. MW radiation may also lead to neuronal shrinkage, nuclear condensation, mitochondrial swelling, an expanded endoplasmic reticulum, alterations to the synaptic gaps and widened vascular endothelial connections, where mitochondrial injury occurred earlier and more severely [5,21,23-25]."

Instead of downplaying the science showing adverse effects, OHA should have at a minimum raised the following issues in depth: In light of the replicated research showing Swiss adolescents had memory damage after one year, what are the implications for young children exposed for a lifetime ? Foerster et. al., 2018 found an effect after one year so what would be the effect after a lifetime of exposure? Why didn't OHA present the data gaps in relation to RFR and neurological impacts, correctly present the study and put it in context?

OHA conclusions on effects to reproduction ignore numerous scientific experiments and exemplifies the flaws in the reports handling of the issue.

OHAs handling of the issue of reproductive effects exemplifies the problematic issues in the OHA report. It would be impossible to go over each section and critique so we are using this section to showcase the errors, haphazard inconsistencies and lack of scientific rigor endemic to the report.

Use studies that did not measure RFR.

- On page 25 OHA begins this section on reproduction first putting forth the studies by Kaiser Permanente: Li et al. (2010) OHA citation 91 which found poor sperm quality; Li et al. (2017) OHA citation 92 which found elevated rates of miscarriage; and Li et al. (2012) OHA citation 177 which found obesity. However, these are all studies measuring magnetic field non ionizing exposures, *not RFR only.* OHA also included Ingle et al. (2020) OHA citation 93 *which measured magnetic fields, not RFR.*

Inaccurately wrote these studies were about RFR.

- Despite the fact that these studies measured non-ionizing radiation exposure with a meter *that measures magnetic fields,* RFR is the wording used by OHA. This is inaccurate. Magnetic fields are not the same as RFR.

Failed to explain the importance of magnetic field studies.

- While the Kaiser Permanente authors are well designed studies and very important to understanding the associations between non ionizing radiation and adverse biological effects (as miscarriage, ADHD, obesity and asthma are linked to magnetic field exposure, ***the OHA authors misrepresented the study and did not discuss it in proper context.***

- No discussion was presented on the difference and overlap between magnetic fields and RFR. Magnetic field measurements can be a proxy for some RFR exposure but it can reflect other ELF- EMF sources and/or a combination of other EMFs. For example a laptop on a pregnant woman's lap will result in both ELF and RF EMF exposures and magnetic fields can be measured as well. A laptop with Wi-Fi off would also result in higher magnetic field measurements even though wireless antennas are turned off. An overhead powerline or occupational exposure to microwave ovens could also be creating higher magnetic field readings - there are many such examples.

The OHA report failed to include other magnetic field research studies if indeed the intention was to review magnetic fields.

- If OHA intended the scope of the report to include magnetic fields then numerous additional studies on magnetic fields should have been included in the review. Yet OHA did not do this. Furthermore, it is notable there were additional studies by the Kaiser team on magnetic fields that were missed by the OHA report and should have been included if indeed OHA meant to put forward studies using magnetic field measurements. Li et al., 2020 found ADHD associated with prenatal magnetic field exposure, yet this study was not in the OHA review. Li et al., 2011 found asthma associated with prenatal exposure to magnetic fields yet this study was not in the OHA review.
- OHA should have included that in 2001 the International Agency for Research on Cancer concluded that exposure to power-line frequency ELF-EMF is a "possible" human carcinogen- a decision based largely on evidence of an increased risk for childhood leukemias with residential exposure .
- In addition to leukemia, miscarriage, asthma, obesity and ADHD, literally hundreds of studies have been published on magnetic fields and ELF-EMF - all omitted from the OHA report. For example, research is documenting other effects such as brain tumors (Carles et al., 2020) congenital heart disease (Zhao et al., 2020) and synergistic effects (Soffritti et al., 2016 and Soffritti et al., 2016). Yet OHA ignores these?

Only four studies in the OHA table reviewed the issue of possible adverse impacts to reproductive organs.

- In fact, there were only *four studies* listed in the OHA review tables regarding impacts to reproductive organs. The studies listed in the table are Wdowia k et al. (2007) (185), Agarwal et al. (2008)(95) Ahlbom et al. (2004) and Al- Quzwiniet al. (2016). **How can a conclusion be based on four publications?**

Fifth study missing from the table reflects lack of consistent methodology.
Furthermore it is notable that an additional study Agarwal et al. (2009) was noted in the OHA discussion on reproductive effects but absent from the table. This omission exemplifies the sloppy mistakes endemic to this report and the lack of any attempt to GRADE the evidence.

Numerous published studies on reproductive effects were omitted.
Numerous published studies on reproductive effects were omitted from the OHA review. After all, the OHA review only lists 4 or 5 if you count the missing citation and as the reviews below confirm, there are numerous other studies in the peer reviewed literature. This omission likely was due to the inadequate search terms although there is no way to know what occurred in the OHA process because OHA did not list studies they rejected after reading the full article.

OHAs conclusions on reproductive effects (from just 4 publications?) are not in line with published reviews on effects to reproduction.
The following scientific reviews on impacts to reproduction came to more detailed and very different conclusions than OHA. *None were included in the OHA review.*

- Negi and Singh 2020 states in their review, " Cell phone radiation harms male fertility by affecting the different parameters like sperm motility, sperm count, sperm morphology, semen concentration, morphometric abnormalities, increased oxidative stress along with some hormonal changes."
- Kesari et al. 2018 states, "From currently available studies it is clear that radiofrequency electromagnetic fields (RF-EMF) have deleterious effects on sperm parameters (like sperm count, morphology, motility), affects the role of kinases in cellular metabolism and the endocrine system, and produces genotoxicity, genomic instability and oxidative stress."
- Singh et al., 2018 states, "available data indicate that exposure to EMF can cause adverse health effects...Persistent exposures of EMF radiation can result in health hazards because these radiations interfere with normal physiological and biological function of the body. EMF works as an environmental pollutant and has undesirable health effects on animals and humans."
- Houston et al., 2016 states "Among a total of 27 studies investigating the effects of RF-EMR on the male reproductive system, negative consequences of exposure were reported in 21. Within these 21 studies, 11 of the 15 that investigated sperm motility reported significant declines, 7 of 7 that measured the production of reactive oxygen

species documented elevated levels and 4 of 5 studies that probed for DNA damage highlighted increased damage, due to RF-EMR exposure."

- Sepehrimanesh and Davis 2016 states, "This paper reviews proteomic experimental and clinical evidence that EMF acts as a male-mediated teratogen and contributor to infertility."
- Adams et al., 2014 states "Our analyses indicate negative associations between mobile phone exposure on sperm viability and motility."

Below is the table from a 2021 published review Negi and Singh 2020 . Although almost all the studies reviewed by Negi and Singh 2020 are in the time frame of the OHA review, only the Agarwal studies are included in the OHA report due to the OHA's unusual scope.

Table 1. Summary of the major parameter of male infertility affected due to exposure.

S.No	Cell type	Source	Radiation exposure	Outcome	References
1.	Testicular cells	Rat	4 G Smartphone RF-EMR exposure at a different time, duration	Impaired testes and upregulates testicular gene Spock3, the establishment of sperm quality and testicular injury by inhibiting overexpression Spock3	Gang Yu et al. (2020)
2.	Testicular cells	Balb/c mice	2.4 GHz, SAR of 30 and 92 mW/kg	Sperm concentration (at a low power density of Wi-Fi radiation) significantly increased	Delavarifar S et al (2020)
3.	Spermatozoa	Mouse	905 MHz, SAR of 2.2 W/kg	Increased mitochondrial generation of ROS and DNA oxidation	Brendan et al (2019)
4.	Testicular cells	Male mice	905 MHz, SAR of 2.2 W/kg	Mitochondrial generation of ROS increased with elevated DNA oxidation	Houston et al. (2019)
5.	Testicular cells	Wistar rats	A dual-band (900 MHz,1800 MHz), SAR of 1.6 W/kg	Nonsignificant decrease in serum testosterone levels.	Okechukwu (2019)
6.	Germ cells	Swiss albino mice	(902.4 MHz and 0.250 W power), SAR of 0.0516 and 0.0054 W/kg	Cellular antioxidant (GSH) levels and anti-oxidative enzyme (SOD) activity shows a significant decrease	Pandey and Giri (2018)
7.	Leydig cells	Mouse	1950 MHz, 3 W/kg	Cell proliferation decreased, cell cycle distribution, Testosterone secretion capacity, and P450scc mRNA level reduced.	Yan-Yun Lin et al. (2017)
8.	Seminal fluid	Human	GSM1800/1900 MHz	Prolonged cell phone daily usage shows a decrease in motility ratio and progressive motility percentage	Hagras et al. (2016)
9.	Spermatozoa	Rat	900 MHz, 0.66 ± 0.01 W/kg	Increases the ROS level and decreases TAC in sperm	Qi Liu et al (2015)
10.	Testicular cells	Rat	900 MHz	Sperm parameters decrease, irregular seminiferous tubules, giant multinucleated cells, and the number of Leydig cells reduced	Bin-Meferij et al (2015)
11.	Seminal fluid	Rat	2.45 GHz, 0.018 W/kg	Significant decrease in sperm count and sperm viability, Reduction in testicular 3β HSD activity and plasma testosterone levels	S.Shahin et al. (2014)
12.	Seminal fluid	Human	Based on the active usage of mobile phone	Sperm DNA fragmentation changed who use the mobile phone for more than 4 h/d	Rago R et al (2013)
13.	Testicular cells	Rat	2.45 GHz, SAR of 0.14 W/kg	Facilitate DNA Damage in testicular cells	Meena et.al (2013)
14.	Plasma Testosterone	Male Sprague Dawley rats	1800-MHz, SAR of 0.5762 W/kg	Regulation of testosterone affected	Qin F et al (2012)
15.	Spermatozoa	Human	900-MHz, SAR 2.0 W/kg	A significant effect on sperm morphometry, decrease in sperm binding to the Hemi zona	Falzone et al. (2011)
16.	Spermatozoa	Male Wistar rats	Mobile phone exposure, SAR of 0.9 W/kg	A decrease in sperm count and apoptosis increased	Kesari et al. (2010)
17.	Seminal fluid	Human	850 MHz, SAR of 1.46 W/kg	Motility and viability significantly reduced, Increased in ROS level while decreased in ROS-TAC score	Agarwal et al. (2009)
18.	Spermatozoa	Human	1.8 GHz, SAR from 0.4 to 27.5 W/kg	Decrease in sperm Motility and vitality while significantly increased in Mitochondrial ROS	De Iuliis et al. (2009)
19.	Spermatozoa	Human	900 MHz GSM, SAR of 2.0 and 5.7 W/kg	Significant decrease in Mitochondrial membrane potential, no effect on motility	Falzone et al. (2008)
20.	Seminal fluid	Human	Based on the mobile phone usage duration	Semen quality decreased, declining the sperm count, motility, viability	Agarwal et al. (2008)

It is notable that *after the publication of the OHA Report,* newly published reviews confirm that non ionizing radio frequency EMFs have been found to harm reproductive organs. For example the study "Current progress on the effect of mobile phone radiation on sperm quality: an updated systematic review

and meta-analysis of human and animal studies" published in Environmental Pollution concludes that "Mobile phone RF-EMR directly impaired mature sperm of men in vitro." and "Mobile phone RF-EMR affected some parameters of sperm quality in experiment animals."

Another example of a systematic review confirming biological effects that was just published is "Effects of electromagnetic fields on neuronal ion channels: a systematic review" published in the Annals of the New York Academy of Sciences (Bertagna 2021). This review focused on effects on neuronal ion channels and concludes that "Here, we systematically clarify how neuronal ion channels are particularly affected and differentially modulated by EMFs at multiple levels, such as gating dynamics, ion conductance, concentration in the membrane, and gene and protein expression. Ion channels represent a major transducer for EMF-related effects on the CNS." This review again confirms that non ionizing EMFs are not benign and clearly have biological effects, especially to the central nervous system. "The central nervous system (CNS) is particularly sensitive to EMF stimuli."

OHA conclusions on RFR impacts to brain waves misses critical studies and lack the sophisticated discussion required for such an important endpoint.

OHA summarizes the research on brain waves and sleep on page 5 stating that, "There was some indication of an effect of RFR on specific brain wave signals. However, not all studies saw this effect."

Even industry supported and ICNIRP scientists state that RFR has been found to impact brain waves (the 8–13 Hz alpha band in waking EEG and the 10–14 Hz "sleep spindle" frequency range in sleep EEG). See Schmid et. al., 2012 , Croft et. al., 2010, Yang et. al., 2016 studies not in the OHA report. ***These effects were found at exposure levels compliant with (and lower than) FCC limits.***

Schmid et. al., 2012 (omitted from the OHA study) states, "Consistent with previous findings, our results provide further evidence that pulse-modulated RF EMF alters brain physiology, although the time-course of the effect remains variable across studies. Additionally, we demonstrated that modulation frequency components within a physiological range may be sufficient to induce these effects."

Comparing the OHA report to a published review study that looked at research from 1996 to 2016 on impacts to the EEG (Danker-Hopfe et. al., 2019) reveals important issues in the OHA report. For example, Danker-Hopfe et. al., 2019 identified 22 papers to review and cites the studies they did not include. OHA does not do this. OHA missed many important studies as well. Hinrikus et al. (2008), Hinrikus et al. (2009) and Hinrikus et al. (2011) were omitted from the

OHA review but found modulated microwave radiation impacts the brain EEG rhythms and differences were found in individual sensitivity to exposure.

Danker-Hopfe et. al., 2019 has a graphical summary of the major findings. OHA has no graphical summaries that compare the studies. The OHA Report has two papers (citation 199 and 200) by some of the authors of Danker-Hopfe et. al., 2019 but not the review itself despite the OHA report putting forward reviews on other endpoints.

Why was this review and the numerous others cited in this document regarding other endpoints not included in the OHA review? How exactly were decisions made by OHA as to what reviews to include and which to emit?

Serious Fundamental Errors

The OHA report contains numerous errors. These mistakes should raise not only serious concerns about the authorship, but also the adequacy of the review and oversight by OHA staff.

Error: The OHA inaccurately defined the RFR frequency range.

OHA Report page 30 states, "OHA identified relevant RFR emissions to be in the frequency range of cell phones and Wi-Fi, or approximately between 1.6 gigahertz (GHz) and 30 GHz."

This is inaccurate. The WHO/IARC defines RFR for their investigation of carcinogenicity as the frequencies of 30 kHz to 300 GHz. How did OHA come up with the range of 1.6 GHz to 30 GHz.

It is hard to have confidence in a study that misidentifies the basic parameter under investigation (albeit lower frequencies are noted among results and the report discussion).

We are unable to discern if this was a mistake or intention. Numerous studies were omitted that used frequencies lower than their identified parameters. Did they omit them because of the frequency or the inadequate search terms? The OHA review did contain studies that used frequencies lower than 1.6 gigahertz but the presentation is haphazard as the OHA report presents studies on high-power AM and FM radio transmitters and television broadcast towers but not a full review of all studies on AM and FM radio transmitters and television broadcast towers.

Even if it was not a mistake and OHA decided they wanted to narrow the studied range of frequencies, ***there is no scientific basis to limit the studies to such a small range as OHA indicated.***
Documentation that the RFR Range should be defined as 30 kHz to 300 GHz.

- Wireless devices have numerous transmitting antennas of numerous frequencies. A typical classroom will have Wi-Fi devices, cell phones, smartwatches, virtual reality and numerous additional transmitting devices. For years, cell phones have operated with frequencies ranging from 700 MHz to 1990 MHz. Now cell phones generally have over five antennas, and laptops and tablets have at least three antennas each with a different frequency. In addition, many schools have cell towers on or near the property exposing children to elevated levels. Thus children in schools will be exposed to a wide range of frequencies.
- 5G antennas which are now being built into cell phones and laptops can use frequencies as low as T Mobile's 600 MHz (same as .6 GHz), far lower than OHA's range. Verizon's 5G Ultra Wideband network uses 39 GHz mmWave spectrum bands, far higher than OHA's range.

Error: OHA is inconsistent with inclusion of studies of magnetic fields potentially associated with RFR.

OHA has a few studies listed that measured magnetic field non ionizing radiation rather than RFR ***yet OHA presented the study as if it were about RFR***. (Li et al. 2017 Citation 92 in OHA Report, Li et al. 2012, Citation 177 in OHA Report, Li et al 2010 Citation 91 in OHA report, Ren et al. 2019, Citation 181 in the OHA Report, Fang et al., 2016 citation 85 in OHA report, Ingle et al. (2020) citation 93 in the OHA report,

All of these studies importantly found low level non-ionizing radiation associated with a harmful effects (miscarriage, obesity, and poor sperm quality) but ***these should not have been included in OHAs report on wireless RFR without clarifications explaining the difference between RFR, ELF and magnetic fields.***

- If OHA was going to look at magnetic fields as a proxy for RFR, then the OHA review should have included *all of the hundreds of other studies on magnetic fields that could do the same.*
- *Furthermore, if OHA looked at Kaiser Permanente's research on health effects from prenatal exposure, why didn't they also include this group's research finding ADHD and asthma associated with prenatal non -ionizing EMF exposure? (* Li et al., 2020, Li et al., 2011)

These systematic mistakes could occur if one was not familiar with the issue of electromagnetic radiation and did not read the study. .These studies do present RFR as the measured metric for exposure.

Sloppy mistakes indicate that research reviewed by OHA was not entirely even read.

On page 78- The OHA Report criticises Miller et al., 2018 -which finds RFR is a human carcinogen - because it (according to OHA) "excludes the large Rothman et al. cohort study showing no effect."

- Yet nowhere in the OHA document is any study with Rothman as author except a 1988 publication (OHA citation 4) which is not a cohort study on cell phone radiation.
- Nowhere in Miller et al., 2018 is a study with the author "Rothman".
- Even if OHA had made a mistake in their report and had meant to reference the two cohort studies generally cited such as Benson et al., 2013 or Frei et al., 2011 -- the OHA authors missed that both of these studies were addressed in the Miller et al. 2018 publication. Benson et al., 2013 was addressed on the sixth page of Miller et. al., 2018 and Frei et al., 2011 was addressed on the fifth and eighth page of Miller et. al., 2018

These mistakes are emblematic of the systemic issues with OHAs report. OHAs inaccurate frequency ranges, errors, omissions and flawed methodology render the report inapplicable to fully characterizing the question at hand- Is wireless exposure in schools hazardous?

To fully detail all the inaccuracies and mischaracterizations of the studies would take numerous additional hours. These mistakes seem to reflect a lack of knowledge on bioelectromagnetics on the part of the authors and raise questions about the nature of the review by OHA senior staff.

If OHA did not have the expertise to perform a sophisticated research review then they should have brought in the independent expertise needed in order to ensure a science based investigation.

The OHA report links to unpublished work.

The OHA report links to unpublished work which makes a sweeping generalization. Endnote 113 is a non peer reviewed unpublished project by a graduate student. Perhaps more importantly, referencing this unpublished document results in an erroneous conclusion. OHA states "a review of studies that assessed RFR exposure in school settings shows that RFR levels were generally well below United States and international guidelines for radiofrequency exposures."

However, published research (Gandhi 2019) shows that cell phones in pockets exceed US limits by up to 11 times. In schools, most teens are walking around with phones in their pockets. Cell phones are used as classroom tools and schools are responsible. Published research also shows wireless laptops on laps can exceed RF limits. For example, the study "Numerical Evaluation of Human Exposure to WiMax Patch Antenna in Tablet or Laptop found RFR exposure limits can be exceeded when the device is in close range to a child body, and also identified hot spots located in more sensitive organs such as the eyes, genitals and breast.

Any discussion of United States and international guidelines for radiofrequency exposures should have presented information on the history and limitations of FCC and international guidelines.

- FCC guidelines are for effects of overheating and based on short term exposures.
- FCC limits are based on an adult male and do not include safety evaluations on the impacts to children, pregnant women or the medically vulnerable.
- FCC compliance tests for cell phones, laptops and the various wireless electronics radiation test devices at a distance from the body- not touching the body- and thus have nothing to do with real world exposures.

The guidelines of the International Commission on Non-ionizing Research Protection also lack protection. Joel Moskowitz, director of the Center for Family and Community Health in the University of California at Berkeley's School of Public Health and creator of the saferemr.com website, said that ICNIRP's guidelines "were designed to protect us only from short-term heating (or thermal) effects. The guidelines fail to protect us from non-thermal effects, especially from long-term exposure to wireless radiation because ICNIRP continues to dismiss the many hundreds of peer-reviewed studies that have found biologic and health effects from exposure to low-intensity, radio frequency radiation including many human as well as animal studies. The preponderance of the research has found evidence of increased cancer incidence, oxidative stress, DNA damage, and infertility from exposure to wireless radiation."

"Established adverse biological outcomes of RF and MW radiation exposure (power density) levels below the FCC guidelines include, without limitation, the increased permeability of the blood brain barrier, nerve damage, alterations in calcium efflux kinetics, increased DNA breakage, induced stress proteins, decreased immune-protection markers, and–at the whole-body level–cognitive and sleep impairments, headaches, dizziness, weakness, tinnitus, cardiac irregularities, hormonal and reproductive aberrations, skin dermatitis, reproductive problems, cancer and more." Declaration of Dr. Magda Havas, B.Sc., Ph.D. United States District Court District of Oregon Portland Division

OHA presents outdated and erroneous industry tied information on mechanisms without presenting the latest science on mechanisms.

Page 12 states of non ionizing radiation "a proposed carcinogenic mechanism is cellular heating" citing a 1997 publication by Repacholi. There are numerous issues with this erroneous statement by OHA.

- Repacholi 1997 is not an article that presents a hypothesis that cellular heating causes cancer but rather explores various biological processes related to athermal, low level RFR. The paper reviews the published laboratory studies that relate to RFR and cancer.
- Most importantly, there is no scientifically documented evidence that heating directly causes cancer. This is well confirmed by the National Cancer Institute in a July 2020 Letter.
- 1997 - over two decades ago - is when the cited Repacholi article was written and since then numerous articles have documented mechanisms by which non-ionizing radiation might impact biological systems such as Havas, M. 2016, Doyon and Johansson 2017, Barnes and Greenebaumb 2018, Markova et al., 2010, and Juutilainen 2018. Why aren't these newer scientific articles presented by OHA?
- ***Repacholi is now well known to have funneled Telecom money to start various organizations and is now an industry consultant.*** Hardel and Carlberg 2017 states "Michael Repacholi immediately set up a close collaboration between WHO and ICNIRP (being head of both organizations) inviting the electric, telecom and military industries to meetings. He also arranged for a large part of the WHO EMF project to be financed by the telecommunication industry's lobbying organisations; GSM Association and Mobile Manufacturers Forum, now called Mobile & Wireless Forum (MWF)."

The Repacholi article cited by OHA focuses on the animal and cell studies as relevant to understanding health risks of RFR, and yet OHA decided animal/cell studies were not relevant to humans. ***"Because experiments cannot normally be conducted on humans, animal studies are very useful for making health risk assessments."***

Published reviews by experts in bioelectromagnetics contradict OHA conclusions.

As a result of the OHA report's flawed design, its conclusions are in direct opposition with the scientific findings reported in numerous peer reviewed published literature reviews.

- The well respected journal Lancet published "Planetary electromagnetic pollution: it is time to assess its impact," documenting how 2266 studies (including in-vitro and in-vivo

studies in human, animal, and plant experimental systems as well as population studies) found that most studies (n=1546, 68·2%) have demonstrated significant biological or health effects associated with exposure to anthropogenic electromagnetic fields.

- Pall 2018 concludes, "Repeated Wi-Fi studies show that Wi-Fi causes oxidative stress, sperm/testicular damage, neuropsychiatric effects including EEG changes, apoptosis, cellular DNA damage, endocrine changes, and calcium overload. Each of these effects are also caused by exposures to other microwave frequency EMFs, with each such effect being documented in from 10 to 16 reviews."
- Jaffar 2019 states, "Sperm count, motility and DNA integrity were the most affected parameters when exposed to RF-EMR emitted by Wi-Fi transmitters. Unfortunately, sperm viability and morphology were inconclusive. Structural and/or physiological analyses of the testes showed degenerative changes, reduced testosterone level, increased apoptotic cells, and DNA damage. These effects were mainly due to the elevation of testicular temperature and oxidative stress activity. In conclusion, exposure towards 2.45 GHz RF-EMR emitted by Wi-Fi transmitters is hazardous on the male reproductive system."
- Choi 2020 concludes, "This comprehensive meta-analysis of case-control studies found evidence that linked cellular phone use to increased tumor risk."
- Kostoff et al., 2020 "Adverse Health Effects of 5G Mobile Networking Technology Under Real Life Conditions" published in Toxicology Letters concludes that 5 G mobile networking technology will affect not only the skin and eyes, but will have adverse systemic effects as well. They state that 5G will increase the cell tower densities by an order of magnitude. The researchers conclude that in aggregate, for the high frequency (radiofrequency-RF) part of the spectrum, currently published reviews show that RF radiation below the FCC guidelines can result in: carcinogenicity (brain tumors/glioma, breast cancer, acoustic neuromas, leukemia, parotid gland tumors), genotoxicity (DNA damage, DNA repair inhibition, chromatin structure), mutagenicity, teratogenicity, neurodegenerative diseases (Alzheimer's Disease, Amyotrophic Lateral Sclerosis), neurobehavioral problems, autism, reproductive problems, pregnancy outcomes, excessive reactive oxygen species/oxidative stress, inflammation, apoptosis, blood-brain barrier disruption, pineal gland/melatonin production, sleep disturbance, headache, irritability, fatigue, concentration difficulties, depression, dizziness, tinnitus, burning and flushed skin, digestive disturbance, tremor, cardiac irregularities, adverse impacts on the neural, circulatory, immune, endocrine, and skeletal systems" and "from this perspective, RF is a highly pervasive cause of disease."

VI. The OHA Report is not consistent with OHAs mission and values nor is it consistent with previous OHA investigations.

OHA's mission page states, "Integrity - We are each accountable for maintaining the highest standards and outcomes in all aspects of our work." ***Yet the OHA report that will impact the lives of so many children did not follow the highest standards in science.***

Lack of transparency and a shroud of secrecy as to the OHA study design.

OHA's mission page states, "We communicate honestly and openly, and our actions are upfront and visible. We provide open access to information and meaningful opportunities to provide input and participate in our decision-making." ***Yet OHA did not keep their actions up front and visible regarding the design and scope of the wireless "review".***

The decision to limit the research to only limited human data was made "behind closed doors." As discussed earlier in this report, OHA should have publicly posted the design as is good practice for reviews of this nature.

Why was there no opportunity for the public to be made aware and comment on a proposed study design?

OHA staff was contacted on several occasions and yet never revealed the industry friendly design of the investigation whereby animal and cell data were omitted. As an example, David Howe, M.A. Program Director Radiation Protection Services Center for Health Protection Public Health Division of the Oregon Health Authority was sent specific research on animals on numerous occasions by Oregon citizens and he never responded with a, "thank you, but we have decided only to look at human data."

There was no transparency in the design of the study.

Why was there no opportunity for the public and stakeholders to review the investigation and scope of work? Why didn't OHA staff respond to citizens emails and communicate honestly and transparently on the study design?

It is notable that the 15 recommendations of the New Hampshire Commission to Study the Environmental and Health Effects of Evolving 5G Technology included: reduce public exposure to cell phones and wireless devices, replace Wi-Fi with wired- non wireless networks in schools and libraries; ensure cell network infrastructure antenna setbacks from schools and homes;

measure levels of cell network radiation; require software changes to reduce radiation exposure into the body and establish wireless radiation-free zones. The New Hampshire Commission met for a year interviewing numerous scientific experts in a fully transparent process where the public was always invited to meetings.

The OHA investigation omits animal and cell data despite the fact that numerous previous OHA investigations rely on animal and cell data.

A review of previous OHA investigations shows that OHA has included animal data in their assessments. Previous OHA reports cite results of the National Toxicology Program and reference the IARC.

Why is OHA treating wireless exposure differently than the other environmental exposures they investigate?

OHA Toxicologist and Deputy State Epidemiologist Ali Hamade's July 24, 2020 presentation "Public Health Aspects of Vaping Toxicology" includes animal studies, as does his September 24, 2020 presentation "Tear Gas & Health Effects" to the House Interim Committee on Energy and Environment which references research that utilized animal research (Slide 5 Rothenberg et al., 2016). Hamande also was listed as commenting "More animal studies on PFNA and PFHxS" in an October 2020 Workshop on Perfluoropolyethers.

We ask why OHA puts forward that animal studies are important for understanding Perfluoropolyethers but not for RFR?

The OHA website on various environmental and potentially toxic exposures with information written for the public ***relies heavily on animal data.***

- OHA webpage on Tear Gas references a 2016 review article from the New York Academy of Sciences.
- OHA webpage on PBDEs references animal studies states "We do know from animal studies that they can harm the brain by causing learning, memory and behavioral disabilities. Animal studies have also found that PBDEs can disrupt the endocrine system by affecting the way the thyroid, reproductive system and immune systems work. They bioaccumulate and stay in the environment for a very long time."
- OHA webpage on PFAS references animal studies states "Additional knowledge of health risks comes from animal studies that have documented multiple specific health

effects in animals, including reproductive, developmental, liver, kidney and immunological effects."

- OHA webpage on PCBS leads to the EPA references on animal studies.

Oregon Law Public Health Division - Chapter 333 Division 16 on HAZARDOUS SUBSTANCES describes how to test animals and references the National Toxicology Program.

Here is a small sampling of Oregon State and OHA health assessments that include animal data and reference NTP and IARC/WHO evaluation and document childrens unique vulnerability- ***all of which the OHA Wireless investigation omits.***

- BLACK BUTTE MINE Health Assessment references the National Toxicology Program research and includes animal data and specifically utilizes thresholds on arsenic and other contaminants developed with animal data.
- Taylor Lumber Public Health Assessment includes animal data and results of National Toxicology Program studies.
- Assessing Potential Health Risks from Microcystin Toxins in Blue–Green Algae Dietary Supplements cites studies of animals.
- J.H. Baxter and Company Health Consultation Includes animal data and results of National Toxicology Program studies and WHO/IARC evaluations.
- Anatoxin-a Oregon Harmful Algae Bloom Surveillance (HABS) Program OHA reviewed available literature on the toxicology of anatoxin-a including animal research.
- Harbor Oil Public Health Assessment cites ATSDR toxicological profiles that use animal data.
- Coos Bay Children's Academy Pesticide Exposure Incident Investigation Report cites animal studies of ASTR and children's unique vulnerability
- PUBLIC HEALTH ASSESSMENT UNION PACIFIC RAILYARD includes animal data and references the International Agency for Research on Cancer evaluations.
- FEASIBILITY INVESTIGATION OF WORKER EXPOSURE TO TRICHLOROETHYLENE AT THE VIEW-MASTER FACTORY IN BEAVERTON, OREGON cites animal data.
- Lebanon Groundwater Contamination cites animal data and references the IARC/WHO.

Why does OHA put forward information on how animal studies provide knowledge of the health effects of various toxic agents on their website, but not include information on animal studies in regards to wireless.

OHA scientists have published research on animal data as relevant to human health, yet animal data was not included in the health assessment.

OHA Report authors have published research on animal data, yet animal data was not included in the health assessment. They also have published on children as a vulnerable population, yet the OHA report did not include this critical information.

Ali Hamade, PhD is co-author to several research studies involving animals such as: "Inhalation of Concentrated Ambient Particulate Matter near a Heavily Trafficked Road Stimulates Antigen-Induced Airway Responses in Mice."

Ali Hamade, PhD used to work for the firm called Gradient.
Here are some of Ali Hamade's publications during his work at Gradient which notably involve animal data:

- "Is exposure to formaldehyde in air causally associated with leukemia?--A hypothesis-based weight-of-evidence analysis," funded by Gradient.
- "Diesel exhaust particulate (DEP) and nanoparticle exposures: what do DEP human clinical studies tell us about potential human health hazards of nanoparticles," funded by Navistar, a diesel engine company
- "Age-related changes in cardiac and respiratory adaptation to acute ozone and carbon black exposures: interstrain variation in mice," funded by Gradient.

Hamade published Book Chapters on asbestos in 2015 and carbon black in 2012 with Peter Valberg of Gradient. As an example of the previous work of OHA authors presenting animal data, their Chapter on carbon black has an entire section on animal studies. ***So we are curious as to why animal studies were omitted from the OHA report on wireless?***

Note: Valberg of Gradient was highlighted in an article by the Center for Public Integrity entitled "Meet the rented white coasts who defend toxic chemicals" which states that "Gradient belongs to a breed of scientific consulting firms that defends the products of its corporate clients beyond credulity, even exhaustively studied substances whose dangers are not in doubt, such as asbestos, lead and arsenic."

Gradient has published papers on radiofrequency and electromagnetic radiation and Gradient scientists such as Peter Valberg often testify in cases regarding wireless radiation.

Komro et al., 2013 "Creating nurturing environments: a science-based framework for promoting child health and development within high-poverty neighborhoods" co-authored by André Ourso, JD, MPH ab Administrator, Center for Health Protection Oregon Health Authority (listed a reviewer to the OHA wireless report) presented a " science-based framework for the promotion

of child health and development within distressed high-poverty neighborhoods" and lists toxic exposures in the physical environment as a critical issue impacting children. "Residents of high-poverty neighborhoods face a greater risk of exposure to physical toxicants." This is an important issue related to wireless because of the body of research showing synergistic effects from RFR (Kostoff and Lau 2017).

Komro et al., 2013 also documents how children in areas with higher pollution and exposures to toxic chemicals are at higher risk and highlights an airborne toxin called black carbon, a marker for motor vehicle exhaust associated with decreased verbal and nonverbal intelligence and impaired memory. Research (which OHA omitted due to the unusually narrow scope) on 2.45 GHz radio frequency - the frequency often used in WiFi networks- in combination with carbon black was found to prolong inflammatory immune responses in Sueiro-Benavides et al, 2020 which concludes that "our results indicate that the interaction of BC and RF modifies macrophage immune response, activates apoptosis, and accelerates cell toxicity, by which it can activate the induction of hypersensitivity reactions and autoimmune disorders."

Komro et al., 2013 also documents that "Even low levels of lead exposure lower children's IQs (Jusko et al., 2008), increase ADHD (Braun, Kahn, Froelich, Auinger, & Lamphear, 2006; Nigg et al., 2008), and increase conduct disorders (Braun et al., 2006)." Research (Byun 2013) investigating the impact of lead combined with radiofrequency found an association between mobile phone use and ADHD symptoms of Attention Deficit Hyperactivity. "The results suggest that simultaneous exposure to lead and RF from mobile phone use was associated with increased ADHD symptom risk."

This research should invite a full and frank discussion on the issue of synergistic exposures, the critical data gaps related to children in neighborhoods with higher pollution, higher lead risks and the cost of inaction for the state.

Toxic exposures could be potentiated by non ionizing EMFs because of impacts to blood brain permeability. Poulletier de Gannes et al., 2017, Nittby 2009, Nittby 2008, Eberhardt 2008, Persson 2008, Salford 2003 have consistently reported increased blood-brain barrier permeability after exposure to EMF. The journal Brain Research published Exposure to 900 MHz electromagnetic fields activates the mkp-1/ERK pathway and causes blood-brain barrier damage and cognitive impairment in rats in Tang 2015. The researchers used exposures that ICNIRP based regulatory limits would assume cannot cause harm as the SAR varied between 0.016 (whole body) and 2 W/kg (locally in the head). This is in line with the findings of Leif Salford and colleagues (Persson al, et al, 1992, Salford et1994, Nittby et al., 2009 , Nittby et al., 2008) showing that exposure of rats to cell phone radiation causes leakage of the blood-brain barrier (BBB). Tang et al. also pointed out that activation of stress response pathway is involved in the

effects, concluding, “Taken together, these results demonstrated that exposure to 900 MHz EMF radiation for 28 days can significantly impair spatial memory and damage BBB permeability in rat by activating the mkp-1/ERK pathway.”

The OHA report ignores the importance of prevention considered the cornerstone of public health.

“An ounce of prevention is worth a pound of cure.”- Benjamin Franklin

“Causal inference is supported by consistency between epidemiological studies of the effects of RFR on induction of human cancer, especially glioma and vestibular Schwannomas, and evidence from animal studies (8). The combined weight of the evidence linking RFR to public health risks includes a broad array of findings: experimental biological evidence of non-thermal effects of RFR; concordance of evidence regarding carcinogenicity of RFR; human evidence of male reproductive damage; human and animal evidence of developmental harms; and limited human and animal evidence of potentiation of effects from chemical toxicants. Thus, diverse, independent evidence of a potentially troubling and escalating problem warrants policy intervention.”- Miller et. al., 2019

The OHA report ignores the precautionary principle put forward by the American Public Health Association and numerous experts.

The OHA report’s conclusion is absent of any precautionary recommendations to protect children despite the fact that numerous published reviews on RFR conclude the public should reduce exposure while research continues.

Despite the fact that numerous authors of the OHA report have Master’s Degrees in Public Health, the OHA report has a glaring absence of adherence to policy statements put forward by the American Public Health Association (APHA). The precautionary principle has been put forward as the cornerstone of public health for decades (Goldstein 2001).

Ronald Melnick, PhD who led the design of the $30M U.S. NTP study during his 28 years as a National Institutes of Health toxicologist presented the study findings in 2019 concluding that, “*Health and regulatory agencies need to promote precautionary measures especially for children and pregnant women. In children the risk can be greater due to the increased penetration as well as the unique sensitivity of the developing brain*.”

Important note: The evidence has accumulated to the point where many scientists are not calling for “precaution” but instead for “caution” as the harm is clearly confirmed by the current body of scientific literature. Nonetheless, for those not decided on the issue, prevention and the precautionary principle present a framework to move forward.

“The precautionary principle asserts that the burden of proof for potentially harmful actions by industry or government rests on the assurance of safety and that when there are threats of serious damage, scientific uncertainty must be resolved in favor of prevention.”

- The APHA 2000 Statement calls for explicit inclusion of the precautionary approach in all federal, state and local legislation rules or policies intended to protect children or that may impact the health of children. It also encourages precautionary action to prevent potential harm to reproductive health, infants and children, even if some cause and effect relationships have not been established with scientific certainty.
- The APHA 2017 Policy statement “Protecting Children's Environmental Health: A Comprehensive Framework” states, “cumulative risks, even at low doses, from other sources can compound the adverse effects of exposure to harmful chemicals or biological agents and necessitate concerted, intentional efforts to protect the youngest and most vulnerable.”

Published research concludes that the public should reduce radiofrequency radiation exposure. Some scientists reference the precautionary principle. Others reference the body of evidence that demonstrates harm is proven.

> “In assessing causal evidence in environmental epidemiology, Bradford Hill himself pointed out that ‘the whole picture matters;’ he argued against prioritising any subset of his famous nine criteria for causation. One’s overall assessment of the likeli- hood that an exposure causes a health condition should take into account a wide variety of evidence, including ‘biological plausi- bility’. After reviewing the evidence cited above, the writer, an experienced physician-epidemiologist, is convinced that RF-EMFs may well have serious human health effects.”
>
> -John William Frank of Usher Institute, University of Edinburgh, Edinburgh, UK in the Journal of Epidemiology and Community Health entitled "Electromagnetic fields, 5G and health: what about the precautionary principle?" 2021

Some examples of published research on non ionizing radiation with conclusions to reduce radiofrequency radiation exposure include:

- Singh and Kappor 2014 conclude, “For the time being, the public should follow the precautionary principle and limit their exposure as much as possible.”
- Bandara and Carpenter 2018 recommend a “coordinated international effort” to reduce public exposure.
- Sangun et al., 2015 reviewed effects to the endocrine system (an issue OHA omitted) and concluded that “Although the results are conflicting and cannot be totally matched with humans; there is growing evidence to distress us about the threats of EMF on children.”
- Redmayne 2016 concludes “minimum exposure of children to RF-EMF is recommended.”
- Miller et al., 2019 concludes, “current knowledge provides justification for governments, public health authorities, and physicians/allied health professionals to warn the population that having a cell phone next to the body is harmful, and to support measures to reduce all exposures to RFR.”
- Moon 2020 a review on impacts to children states, “Precautionary approaches are recommended for children…”
- Frank 2021 concludes, “after reviewing the evidence cited above, the writer, an experienced physician-epidemiologist, is convinced that RF-EMFs may well have serious human health effects...Based on the precautionary principle, the author echoes the calls of others for a moratorium on the further roll-out of 5G systems globally, pending more conclusive research on their safety.”

In 2011, the WHO and IARC issued a press release announcing the classification of wireless radiation as a possible human carcinogen and also recommended precautions. IARC Director Christopher Wild advised that people take precautions to reduce exposures to cellphone radiation, stating that “Given the potential consequences for public health of this classification and findings it is important that additional research be conducted into the long-term, heavy use of mobile phones. Pending the availability of such information, it is important to take pragmatic measures to reduce exposure such as hands-free devices or texting.”

“Educational and public health institutions should be encouraged to reduce exposures, especially of young children, to RF devices...A careful review of the scientific literature demonstrates there are potentially dangerous effects from RF,“ stated Christopher Portier, a recently retired CDC Director, Center for Environmental Health and the Agency for Toxic Substances and Disease in his official call for invoking the precautionary principle.

It is notable that several countries have put the precautionary policy into action and have RFR exposure limits far below U.S. Federal Communication Commission’s (FCC) limits and have adopted special policies to decrease exposure near homes and schools. These countries include: China, Russia, Belgium, Israel, Chile, Belarus, Bulgaria, Serbia, Slovenia, Montenegro, Italy,

Switzerland, Greece, India, Liechtenstein, Tajikistan, Kazakhstan, Ukraine, Uzbekistan, Kyrgyzstan (Redmayne 2016, RIVM 2018, WHO 2020).

Russia, China and India document that their far stricter exposure limits are based on the scientific research showing harm at levels below ICNIRP/FCC limits and are not precautionary but rather "science based" (Wu 2015, Repacholi 2012, Sundersanam 2012).

The American Public Health Association Public Health Code of Ethics is the roadmap forward.

Environmental Justice and Health Inequities

The APHA Public Health Code of Ethics states on page 5 that "Public health practitioners and organizations have an ethical responsibility to prevent, minimize, and mitigate health harms and to promote and protect public safety, health, and well-being," yet the OHA report does not address prevention. *Instead this report will serve to promote false safety assurances and promote the unrestrained use of wireless in schools in the state and nationwide.*

In line with the APHA code of ethics, OHA should retract their report, redesign the study to include all streams of evidence, and at a minimum have a section on data gaps explaining how safety is not assured and a list of risk mitigation measures recommended by experts.

The APHA Public Health Code of Ethics states on page 5 that "Public health practitioners and organizations have an ethical obligation to use their knowledge, skills, experience, and influence to promote equitable distribution of burdens, benefits, and opportunities for health, regardless of an individual's or a group's relative position in social hierarchies. Health justice and equity also extend to ensuring that public health activities do not exacerbate health inequities. "

However, the OHA report is void of the reality that exposure to wireless and cell tower radiation is an environmental justice issue with disproportionate impacts to communities.

- Cell towers have been found to be more often placed on schools in lower income areas (See Parents Coalition and WJLA News "MCPS places controversial cellular towers at predominantly high-poverty schools, stats show") . Wealthy communities often immediately organize to halt proposed cell towers at schools as soon as they become aware. As an example, after a meeting where parents and neighbors located in a wealthy community near Washington DC expressed strong opposition to a proposed cell tower for Wootton High School,the proposal was halted the next morning.

- Private schools will get private funding to install wired networks and reduce RF exposures.
- While often wealthier, educated families inform their children to decrease exposure (like keep the phone away from your brain) and have the financial means to purchase adapters and hardwire computers to minimize Wi-Fi, people with less financial means remain uninformed about wireless radiation and mitigation is not affordable as an iphone.iPad adapter can run over 100 dollars and laptop USB adapters are around 30 dollars. Many families are struggling to get any internet access at all and are not in a privileged position to choose wired technologies over wireless in their home. So for example monthly rental for a wireless hotspot can be under 20 dollars a month but monthly rental for a modem and home internet service starts around 60 dollars a month.
- Schools in low income areas are used as test beds for industry to try out new wireless products such as 5G and virtual reality despite no research indicating it will support academic achievement of the students.
- Communities with higher environmental exposures to toxic chemicals, heavy metals (such as lead) and air pollution will have disproportionate impacts from RFR exposure as research shows a synergistic effect between EMFs and toxic agents (Kostoff and Lau 2017).
- As an occupational health issue, many people have limited ability to reduce RFR without risking losing their jobs.
- Racial/ethnic minorities are 1.5 to 2.0 times more likely than whites to have most of the major chronic diseases. Oxidative stress is understood to play a role in the development of many chronic diseases as well as cancer. Research reviews (Schuermann and Mevissen, 2021, Yakymenko et al. 2016) repeatedly find that non-ionizing EMF exposure can cause oxidative stress by the increase in free radicals.
- Research links non-ionizing radiation with diseases that minority communities already have higher rates of such as obesity, asthma and diabetes. As another example, African American women face a significantly higher risks of having a miscarriage and replicated research links non ionizing radiation to increased miscarriage risk.
- Health care inequalities will further exacerbate health inequities as people in under-resourced communities will receive unequal care for the damages from chronic disease caused by or exacerbated by RFR and other non ionizing electromagnetic radiation exposure.

In line with the APHA code of ethics, OHA should retract their report, redesign the study to include all streams of evidence, and include a science based section on health inequities, synergistic exposures and the undue impact posed to vulnerable communities already faced with serious environmental exposures.

Transparency

The APHA Public Health Code of Ethics states on page 6 that "Public health practitioners and organizations have an ethical responsibility to be transparent, to be accountable to the public at large…" *The OHA report moved forward with an industry friendly design, omitting the entire body of animal research that documents clear evidence of cancer and numerous other biological effects.*

In line with the APHA code of ethics, OHA should retract their report, redesign the study to include all streams of evidence, and include the science on all the adverse biological effects.

Involve affected stakeholders

The APHA Public Health Code of Ethics Page 10 states that "Decisions that affect the trust of minority and marginalized communities, or that are highly sensitive and divisive, require concerted efforts to involve affected stakeholders. Public participation can enhance the legitimacy, transparency, and justice of decision making and build trust in public institutions." One could argue that wireless is a highly sensitive subject. Yet OHA did not present the investigation design to the public. If OHA had, then stakeholders and scientists with expertise in the area would have had an opportunity to comment. The public was locked out of the process. The public did write and send research to OHA. Yet OHA staff did not respond with any information. OHA moved forward with a cloak of secrecy. *OHA did not disclose the methodology they would use to the public. Why did OHA withhold this all year long? Was it intentional to keep stakeholders in the dark on the unusual study design.*

In line with the APHA code of ethics, OHA should retract their report, redesign the study to follow best practices for systematic review regarding environmental health exposures which would include transparency in the process.

Will the investigation help achieve stated health goals?

The APHA Public Health Code of Ethics states on page 8 that when evaluating a proposed action it should be asked "Is it reasonable to expect, based on best available evidence and past experience, that the proposed action would achieve its stated health goals?" OHA was tasked to follow the mandate of SB 283 which was to review the research on wireless and health. SB also states that the Department of Education should develop RFR reduction strategies if OHA determined RFR was hazardous. Yet OHA designed a research review that did not consider all the potential health effects and did not consider the findings of highly respected animal studies.

OHA should have known that any "determination" in such a skewed investigation would rest on an inadequate database. The OHA mission statement says, "Our common goal is to protect and promote the health of all people in Oregon."

The OHA should have asked itself before designing such a narrow literature review, "*Is it reasonable to expect, based on best available evidence and past experience, that the proposed OHA review would achieve its stated health goals of ensuring students and staff in schools are protected from harm?*"

In line with the APHA code of ethics, OHA should retract their report, redesign the study to include all streams of evidence, and ensure the objective is to investigate RFR in the school setting (from all sources present in the school setting) and to protect the children of Oregon.

Systematic, comprehensive data collection and analysis

The APHA Public Health Code of Ethics states on page 12 that "Public health practitioners and organizations should strive to conduct and disseminate meaningful health assessments focused on population health status and public health issues facing the community. Health assessments, which can exist at the state, tribal, local, or territorial level, generally seek to identify key health needs and issues through systematic, comprehensive data collection and analysis." *Yet the OHA review did not involve "systematic, comprehensive data collection and analysis," as animal and in-vitro research was fully ignored.*

In line with the APHA code of ethics, OHA should retract their report, redesign the study to follow best practices for systematic review regarding environmental health exposures.

Safeguards in place so that public health information does not harm communities nor be misinterpreted by decision makers

The APHA Public Health Code of Ethics on page 12 states that "Ethical policies and practices used to conduct and disseminate assessments of public health status and public health issues facing communities should….Have safeguards in place so that public health information does not harm individuals or communities…...Appropriate care should be taken in anticipating public interpretation, misinterpretation, or adverse reaction to public health information and language." However, we expect that the OHA report will likely be interpreted to mean that wireless is safe. The OHA report has no verbiage in it clarifying that safety is not assured. Most people will only read the summary. When the public advocates for installing safer wired systems in classrooms, the OHA report will be presented to them as proof that such concerns are unsubstantiated. *Thus,*

this report will likely harm the public and especially Oregon's children who will continue to be exposed in schools due to the OHA report.

Professor John William Frank, a physician and epidemiologist from the University of Edinburgh, says we should 'err on the side of caution' by delaying any further roll-out of 5G globally, 'pending more conclusive research' on its safety in his article on children and non-ionizing radiation (Frank 2021).

In line with the APHA code of ethics, OHA should retract their report, redesign the study to follow best practices for systematic review and ensure the summary includes language that will not be misinterpreted to mean that RFR has been found "safe" as this would be inaccurate.

Collect relevant data

The APHA Public Health Code of Ethics states on page 14 that "When investigating health problems and environmental hazards, it is necessary to collect the information most relevant to characterizing the problem in question…" And yet, the OHA report did not collect all the information relevant to the problem. *They omitted critical animal research, omitted numerous studies finding impacts to brain development, omitted research characterizing actual RFR exposures in school and omitted the science on the unique vulnerability of children.*

In line with the APHA code of ethics, OHA should retract their report, redesign the study to follow best practices for systematic review regarding environmental health exposures.

Ensure data validity and account for the limitations of available data

The APHA Public Health Code of Ethics page 14 on Investigations of health problems and environmental public health hazards states that "Ensure data validity, account for the limitations of available data, determine statistical thresholds for defining significance, and take steps to assist others who use the data, including the media and policymakers, so they will not draw inappropriate conclusions regarding cause and effect." OHA did not ensure data validity as the report shows. OHA did not account for the limitations of the data. Where is the discussion on data gaps? *If the media and legislatures put forward the assumption that wireless is safe, will OHA clarify that just because their narrowly scoped report found no effect, this does not mean safety is assured?*

In line with the APHA code of ethics, OHA should retract their report, address the errors, redesign the study to follow best practices for systematic review regarding environmental health exposures and once the report is completed assist the media and policymakers in drawing appropriate science based conclusions.

Other codes of ethics can be helpful as a roadmap.

- The Code of Ethics for the Members of the Health Physics Society (Health Physics Society) states "professional statements made by members shall have sound scientific basis" and "each member shall be a judge of his or her competence and will not undertake any assignment beyond his or her abilities."
- The Oregon State University has a code of ethics (Oregon State University) that states, "We strive for excellence in our pursuit of knowledge and maintain high standards in all activities and duties."

The implications of this report are far reaching and pose serious accountability and liability issues

Ultimately the responsibility for the OHA report rests with the Oregon Health Authority and the Oregon legislature. We hope OHA authors and reviewers will do the right thing and retract their report. We hope that the elected officials of Oregon will review this material and call for it's retraction. OHA's mission page states, "Integrity - We are each accountable for maintaining the highest standards and outcomes in all aspects of our work."

If this report is not retracted then what are the implications in terms of liability. Could OHA or involved individuals be held accountable and liable for future policy decisions justified by the report? How will the children of Oregon be affected? The importance of urgently addressing the errors and systemic issues in OHA's report cannot be underestimated.

Implications for the children of Oregon and all children in the United States

- OHA's report will impact all the children in Oregon. More importantly, the OHA report is likely to be used by other states in the United States whenever health and safety issues related to wireless in school are raised.

Implications for action or inaction by the Oregon Department of Education

- SB 283 (2019) states that the Department of Education should develop RFR reduction strategies if OHA determined RFR was hazardous. We expect the DOE will now NOT develop RFR mitigation strategies because the flawed OHA report seems to give RFR the "all clear".

Implications for action or inaction by the Oregon Legislature

- Policymakers and clinicians often rely on Department of Health reports to provide accurate and up-to-date overviews of a topic of interest.

- This report will likely be used as proof of safety whenever the issue of health and safety regarding RFR, cell towers of 5G is raised in proposed legislation in the state and throughout the United States. This flawed report will likely be cited as proof of safety for the continued proliferation of cell antennas for 4G and 5G, as well as the use of 5G and wireless technology in schools.

Implications for legal cases and liability

This report could be used in future legal actions both as proof of safety and as a reason for legal action against Oregon.

Insurers rank wireless, 5G and non ionizing electromagnetic radiation as a "high" risk, comparing the environmental exposure to lead and asbestos. In turn, most commercial liability insurance policies have very clear "electromagnetic field exclusions" as the industry standard. Insurance companies and wireless companies themselves classify wireless and non ionizing radiation as a type of "pollution."

Will OHA be held liable for future harm? Will the states be liable for future harm? Will they have insurance coverage? Will taxpayers ultimately be financially responsible for lawsuits aimed at OHA or the state in regards to RFR?

- The Portland Oregon Public School Insurance states, "This insurance does not apply to: Bodily injury, personal injury, advertising injury, or property damage arising directly or indirectly out of, resulting from, caused or contributed to by electromagnetic radiation…."

- It also states; "...cost or expense arising directly or indirectly out of, resulting from, caused or contributed to by electromagnetic radiation provided that such loss, cost or expense result from or are contributed to by the hazardous properties of electromagnetic radiation. This includes any costs for the actual or threatened abatement, mitigation or removal."

- Some insurance companies not only exclude coverage for harm, but also exclude coverage for defense related to recommendations that should or should not have been given. For example, the City of Ann Arbor Michigan Insurance Policy: Electromagnetic Radiation Exclusion not only excludes mitigation and harm from electromagnetic radiation but also excludes paying for the defense of "any supervision, instruction, recommendation, warning or advice given or which should have been given in

connection with bodily injury, property damage, abatement and/or mitigation etc. (page 14)

- Wireless companies themselves define non-ionizing radiation as a "pollutant". Both AT&T Mobile Insurance (pg. 4) and Verizon Total Mobile Protection(page 10) state that coverage is excluded for pollutants, which are defined as "Any solid, liquid, gaseous, or thermal irritant or contaminant including smoke, vapor, soot, fumes, acid, alkalis, chemicals, artificially produced electric fields, magnetic field, electromagnetic field, sound waves, microwaves, and all artificially produced ionizing or non-ionizing radiation and waste."
- A 2019 Report by Swiss Re Institute, a world leading provider of insurance, classifies 5G mobile networks as a "high", "off-the-leash" risk stating, "Existing concerns regarding potential negative health effects from electromagnetic fields (EMF) are only likely to increase. An uptick in liability claims could be a potential long-term consequence" and "[a]s the biological effects of EMF in general and 5G in particular are still being debated, potential claims for health impairments may come with a long latency."
- Verizon Wireless warns their shareholders in their 10-K form to the US Securities and Exchange Commission that: "Our wireless business also faces personal injury and wrongful death lawsuits relating to alleged health effects of wireless phones or radio frequency transmitters. We may incur significant expenses in defending these lawsuits. In addition, we may be required to pay significant awards or settlements."

The children of Oregon deserve a professional high quality assessment of the hazard posed by wireless radiation.

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