Cindy Russell, MD
March 12, 2018
Response to NTP report on Cell Phones and Brain Cancer

Dear Researchers and Scientists at the NTP:

I am writing to comment on your work at NTP and also to thank you for your ongoing important research into the adverse effects of radiofrequency radiation we are now almost continuously exposed to from cell phones, cell towers and wireless devices. More independent research needs to be funded in this field.

The National Toxicology Program Report on Cell Phones and Brain Cancer has been important in supporting evidence of harm from RFR, highlighting that glioma and Schwann cells in the brain, nervous system and heart as well as other organs are a target for radiofrequency radiation through whole body exposure.

According to your report, the study found a statistically significant increase in tumors of the heart and brain as well as an increase in tumors of the prostate gland, pituitary gland, adrenal gland, liver, and pancreas. The report also states there were Increases in non-neoplastic lesions in the heart, brain, and prostate gland of male rats, and of the heart, thyroid gland, and adrenal gland in female rats with exposure to GSM cell phone RFR at 900 MHz. There were also consistent reports of perinatal effects in both the 28-day and 2-year studies, including lower dam body weights in late gestation and lactation, lower pup body weights and lower pup survival rates.

The research supports both an association and causation for cancer from RFR. In addition, findings indicate that RFR was associated with increases in an unusual pattern of cardiomyopathy in exposed male and female rats. Reproductive abnormalities were also identified.

It is notable that rat studies do have some limitations. There is variability in rat strains and cancer incidence and viability. Sprague Dawley rats were used in the NTP study over the inbred Fischer rats as they have a lower spontaneous background tumor rate. There is a known decrease in survival of SD rats compared to Fischer rats which have been used in prior NTP studies. Rats that died early are at less risk of developing tumors than rats that died late.

Spontaneous primary cardiac tumors are rare in rats, occurring with an apparent frequency overall of 1.8%, according to your report.

Some elements of the NTP study were criticized, stating these indicated a faulty study.

1) **Only males developed brain tumors:** The literature indicates that there is often gender differences in outcomes in animal carcinogenicity studies. This could be due to differences in hormone levels. The literature also indicates that the estrogen produced in females seem to provide neuroprotection. This could be due to the antioxidant protective effects of estrogen on the brain. (6,7,8) It appears that 17 beta-estradiol (E2) is also cardio-protective in females. (9)

2) **None of the controls developed tumors:** This could be explained by the fact that these rats were housed in very clean environments, free of any confounding radiation. This unexpected result may give more strength to the association between ambient chronic low level radio frequency radiation and cancer.

While your research supports adverse effects from wireless radiation, it is not the only research to identify harm. Yakymenko et al. in 2016 (https://mdsafetech.org/cellular-mechanisms-oxidation/) looked at 100 currently available peer-reviewed studies on oxidative effects of low-intensity microwave radio frequencies. He found that 93 of the 100 studies confirmed that these wireless radio frequencies induced oxidative effects in biological systems. Studies have also identified the protective effects of vitamin C, E and other antioxidants with exposure to radio frequencies. It is perhaps this oxidative effect which caused the cardiomyopathy. Mitochondria could be the target of biological harm. Careful studies have shown adverse cellular effects with non-thermal RFR exposures.

With acute exposure to higher levels or chronic exposure to lower levels of non-ionizing radiofrequencies cumulative tissue damage can occur. Genetics, age, chronic disease and synchronous exposure to other toxins influence the repair abilities of cells and thus additional toxic exposure from RFR can enhance biologic harm. This needs to be taken into account in real life exposures and studied in the lab.

Many studies have shown an association of RFR and brain cancer. https://mdsafetech.org/science/cancer/)

Many studies show RFR damages nerve cells. (https://mdsafetech.org/nervous-system/) This is likely an effect from RFR of creating damaging reactive oxygen species which affect proteins and DNA.

Many studies show damage to sperm and reproduction. (https://mdsafetech.org/science/reproductive/) .

Many studies show that people are developing electrosensitivity in the presence of wireless devices. This often comes after a toxic high exposure to RFR or an infectious agent, likely damaging mitochondria and making the person vulnerable to harm from RFR, even at low levels. (https://mdsafetech.org/science/es-science/)

RFR from wireless devices appears to act as a common toxic exposure similar to other chemical toxins and metals. In this increasingly wireless environment more people will be developing chronic diseases. It will take decades (if it is even possible) to sort out the additive contribution of harm from wireless technology. Your research indicates that guidelines need to be based on biological cellular effects and not thermal effects. Precaution is warranted. Reduction of exposure to RFR is a preventative public health measure.

Please continue this critical research for the health and wellbeing of future generations and the environment.

Sincerely,
Cindy Russell, MD

References

1) **Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague**

Dawley® SD rats (Whole Body Exposures). Draft May 19, 2016. https://www.biorxiv.org/content/biorxiv/early/2016/05/26/055699.full.pdf

2) **Comparison of NTP Historical Control Tumor Incidence Rates in Female Harlan Sprague Dawley and Fischer 344/N Rats**. GREGG E. DINSE . Toxicologic Pathology, 38: 765-775, 2010. http://journals.sagepub.com/doi/pdf/10.1177/0192623310373777

3) **High exposure to radiofrequency radiation linked to tumor activity in male rats.** Feb 2, 2018. NIH. https://www.nih.gov/news-events/news-releases/high-exposure-radiofrequency-radiation-linked-tumor-activity-male-rats

4) **TR-595: Toxicology and Carcinogenesis Studies in Hsd:Sprague Dawley SD Rats Exposed to Whole-Body Radio Frequency Radiation at a Frequency (900 Mhz) and Modulations (GSM and CDMA) Used by Cell Phones.** Feb, 2018 https://ntp.niehs.nih.gov/results/pubs/longterm/reports/longterm/tr500580/listedreports/tr595/index.html

5**) Spontaneous Cardiac Tumors in Eight Rats .** (1981) Robertson et al Vet. Pathol. 18: 30-37 (1981). https://www.ncbi.nlm.nih.gov/pubmed/7072083 or http://journals.sagepub.com/doi/pdf/10.1177/030098588201900106

6) **Estrogen Actions in the Brain and the Basis for Differential Action in Men and Women: A Case for Sex-Specific Medicines (2010)** Gilles GE, et al. Pharmacol Rev. 2010 Jun; 62(2): 155–198. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2879914/

7) **The Effects of 17β Estradiol, 17α Estradiol and Progesterone on Oxidative Stress Biomarkers in Ovariectomized Female Rat Brain Subjected to Global Cerebral Ischemia. (2009)** V. H. OZACMAK, H. SAYAN. Physiol. Res. 58: 909-912, 2009. https://pdfs.semanticscholar.org/da6d/0196c9e83f02e490ffe0c4a2118d3236f452.pdf

8) **Role of Estrogen and Other Sex Hormones in Brain Aging. Neuroprotection and DNA Repair. (2017)** Zarate S, et al. Front. Aging Neurosci., 22 December 2017. https://www.frontiersin.org/articles/10.3389/fnagi.2017.00430/full

9) **Potential phytoestrogen alternatives exert cardio-protective mechanisms via estrogen receptors.** (2017) Shibu SA, etal. Biomedicine (Taipei). 2017 Jun;7(2):11. https://www.ncbi.nlm.nih.gov/pubmed/28612709

10) **Draft Reports, Public Comments, and Related Information: TR Peer Review Panel.**
https://ntp.niehs.nih.gov/about/org/sep/trpanel/meetings/docs/2018/march/index.html

11) **NTP TECHNICAL REPORT ON THE TOXICOLOGY AND CARCINOGENESIS STUDIES IN Hsd:SPRAGUE DAWLEY SD RATS EXPOSED TO WHOLE-BODY RADIO FREQUENCY RADIATION AT A FREQUENCY (900 MHz) AND MODULATIONS (GSM AND CDMA) USED BY CELL PHONES**. Scheduled Peer Review Date: March 26 to 28, 2018.
https://ntp.niehs.nih.gov/ntp/about_ntp/trpanel/2018/march/tr595peerdraft.pdf

12) **BioInitiative Working Group**, Cindy Sage and David O. Carpenter, Editors. BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Radiation at www.bioinitiative.org, December 31, 2012 at www.bioinitiative.org

13**) Fetal Radiofrequency Radiation Exposure From 800-1900 Mhz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice. (2017)** Aldid, T.Nature. Scientific Reports 2, Article number: 312. Feb 18, 2013.
http://www.nature.com/srep/2012/120315/srep00312/full/srep00312.html

14) **Maternal cell phone use during pregnancy and child behavior problems in five birth cohorts. International Society for Environmental Epidemiology. (2017)**
https://ehp.niehs.nih.gov/isee/2016-o-021-4271/

15) **Postnatal development and behavior effects of in-utero exposure of rats to radiofrequency waves emitted from conventional WiFi devices. (2017)** Othman H et al. Environ Toxicol Pharmacol. 2017 Apr 22;52:239-247.
https://www.ncbi.nlm.nih.gov/pubmed/28458069

16) **Effects of prenatal exposure to WIFI signal (2.45GHz) on postnatal development and and behavior in rat: Influence of maternal restraint. (2017)** Othman H et al., Behave Brain Res. 2017 Mar 10;326:291-302. https://www.ncbi.nlm.nih.gov/pubmed/28288806

17) **Long-term exposure to 835 MHz RF-EMF induces hyperactivity, autophagy and demyelination in the cortical neurons of mice. (2017)** Kim JH, Yu DH, Huh YH, Lee EH, Kim HG, Kim HR.. Sci Rep. 2017 Jan 20;7:41129 http://www.nature.com/articles/srep41129

18) **The effect of Wi-Fi electromagnetic waves in unimodal and multimodal object recognition tasks in male rats. (2107)** Hassanshahi A, et al. Neurol Sci. 2017 Mar 22. https://www.ncbi.nlm.nih.gov/pubmed/28332042

19) **Rats exposed to 2.45GHz of non-ionizing radiation exhibit behavioral changes with increased brain expression of apoptotic caspase 3. (2017)** Varghese R et al. Pathophysiology. 2017 Nov 14. S0928-4680(17)30052-4. https://www.ncbi.nlm.nih.gov/pubmed/29153770

20) **Effect of Low Level Subchronic Microwave Radiation on Rat Brain.(2016)** Deshmukh PS, Megha K, Nasare N, Banerjee BD, Ahmed RS, Abegaonkar MP, Tripathi AK, Mediratta PK. Effect of Low Level Subchronic Microwave Radiation on Rat Brain. Biomed Environ Sci. Dec;29(12):858-867. http://www.sciencedirect.com/science/article/pii/S089539881730003X

21) **Mechanism of low-level microwave radiation effect on nervous system. (2016)** Hinrikus,H. Electromagn Biol Med.2016 Nov 22:1-11. https://www.ncbi.nlm.nih.gov/pubmed/27874295

22) **Exacerbation of demyelinating syndrome after exposure to wireless modem with public hotspot. Case report. (2016)** Johansson O, Redmayne M. Electromagnetic Biology and Medicine. Jun 29, 2016. http://www.tandfonline.com/doi/abs/10.3109/15368378.2015.1107839

23) **Adverse effects in lumbar spinal cord morphology and tissue biochemistry in Sprague Dawley male rats following exposure to a continuous 1-h a day 900-MHz electromagnetic field throughout adolescence. (2016)** Kerimoğlu G. J

Chem Neuroanat. Dec;78:125-130.
https://www.ncbi.nlm.nih.gov/pubmed/27650207

24) **Pernicious effects of long-term, continuous 900-MHz electromagnetic field throughout adolescence on hippocampus morphology, biochemistry and pyramidal neuron numbers in 60-day-old Sprague Dawley male rats. (2016)** Kerimoğlu G.
jchemneu..07.004. https://www.ncbi.nlm.nih.gov/pubmed/27430379

25) **Maternal exposure to a continuous 900-MHz electromagnetic field provokes neuronal loss and pathological changes in cerebellum of 32-day-old female rat offspring. (2016)** Odacı E. J Chem Neuroanat. 2016 Sep;75(Pt B):105-10.
https://www.ncbi.nlm.nih.gov/pubmed/26391347