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NTP cell phone studies — experts recommend elevated conclusions

By Virginia Guidry

A panel of external scientific experts met March 26-28 at NIEHS and recommended that some National Toxicology Program (NTP) conclusions be changed to indicate stronger levels of evidence that cell phone radiofrequency radiation (RFR) caused tumors in rats.

The panel agreed with NTP conclusions that there was little indication of RFR-related health problems in mice. The panel reviewed the conclusions of two draft technical reports (https://ntp.niehs.nih.gov/about/org/sep/trpanel/meetings/docs/2018/march/index.html) , one in rats and one in mice, based on 10 years and $25 million of research.

Bucher cautioned that the findings tell us that we should take a closer look, but they should not be directly extrapolated to human cell phone usage. (Photo courtesy of Steve McCaw)

“It was gratifying that the members of the expert panel unanimously praised the NTP cell phone studies as very well done, and vitally important research,” said NTP Senior Scientist John Bucher, Ph.D. “They conducted a thorough review, engaged in spirited debate, and grappled with the same uncertainties as did the NTP staff.”

Bucher stressed that the goal of the study was to establish the potential health hazard of exposure to cell phone RFR. He said that to detect a potential effect, the rodents’ whole bodies were exposed to levels equal to and higher than the highest level permitted for local tissue exposure in cell phone emissions today.

Final report expected this fall

NTP staff will now evaluate each of the recommendations from the panel and prepare a final report, which they expect to complete this fall.

“The director has the authority to accept or reject the advice of the advisory panel. Once she has evaluated these recommendations, the changes will be made public,” Bucher said.

Tips for reducing exposure

If you are concerned about potential exposure to cell phone RFR, the U.S. Food & Drug Administration (https://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones/ucm116293.htm) has the following suggestions:

- Reduce the amount of time you use your cell phone.
- Use speaker mode or a headset to place more distance between your head and the cell phone.

Heart, brain, and adrenal tumors

Working from the NTP scale of clear evidence, some evidence, equivocal evidence, and no evidence, the panel made several recommendations.

The experts recommended that tumors in tissues surrounding nerves in the hearts of male rats, called malignant schwannomas, be reclassified from some evidence to clear evidence of carcinogenic activity.

In female rats, they recommended reclassification of malignant schwannomas from no evidence to equivocal evidence of carcinogenic activity. The panel agreed that there were unusual patterns of cardiomyopathy, or damage to heart tissue, in exposed male and female rats.

Panel chair David Eaton, Ph.D., of the University of Washington, said NTP was clairvoyant for including *in utero* exposure long before this was commonly considered in toxicology. (Photo courtesy of Steve McCaw)

“When I look at these types of studies, I look for high-level signals that can infer mechanisms. I have more questions than answers, but the heart is clearly sending a signal in the rat studies, between the levels of cardiomyopathy and malignant tumors,” said panelist Rick Adler, D.V.M., Ph.D., senior director of discovery and regulatory pathology for GlaxoSmithKline.

The panel recommended that findings for a type of brain tumor, called malignant glioma, and a tumor in the adrenal gland, called pheochromocytoma, be reclassified as some evidence of carcinogenic activity in male rats.

Tissue changes and lower body weights

NTP researchers also looked for noncancerous health effects in rats and mice. The panel agreed that there were increases in damage to brain tissue in exposed male and female rats, which further supported the classifications of cancerous effects in the brain.

For several other tissues, including the prostate and pituitary glands, the panel agreed that tissue changes were

equivocal, meaning it was unclear if any of these tumor increases were related to RFR.

NTP also reported lower body weights among newborn rats and their mothers, especially when exposed to high levels of RFR during pregnancy and lactation, but these animals later grew to normal size.

“I want to highlight that we don’t rely on one specific item for determining response,” said NTP toxicologist Chad Blystone, Ph.D. He explained that NTP staff review numerous factors when determining conclusions, including those listed below.

Blystone oversaw internal scientific reviews with NTP staff. (Photo courtesy of Steve McCaw)

- Statistics.
- Dose-response relationship.
- Commonality of tumors and tissue changes.
- Comparison to concurrent and historical controls.
- Findings across sexes and species.

Most expensive, technically challenging studies

To conduct the studies, NTP worked with collaborators at the IT’IS Foundation (https://www.itis.ethz.ch/who-we-are/) to design special chambers that exposed rats and mice to different levels of RFR for up to two years, including exposure to pups while in the womb.

Myles Capstick, Ph.D., of the IT’IS Foundation explained that they wanted to expose the whole animals because they were not sure where health effects might occur. “We were aiming to expose as many tissues as possible, not mimic a phone next to the head,” said Capstick.

From right, John Ladbury of the National Institute of Standards and Technology, Kuster, and Capstick presented the exposure system and how it was validated. (Photo courtesy of Steve McCaw)

Exposure levels ranged from 1.5 to 6 watts per kilogram in rats and 2.5 to 10 watts per kilogram in mice. The low power level for rats was equal to the highest level permitted for local tissue exposures to cell phone emissions today. The animals were exposed for 10-minute on, 10-minute off cycles that totaled more than 9 hours each day.

The studies used 2G and 3G frequencies and modulations that are still used in voice calls and texting in the United States. More recent 4G, 4G-LTE, and 5G networks for streaming video and downloading attachments use different cell phone signal frequencies and modulations than NTP used in these studies. Niels Kuster, Ph.D., of the IT'IS Foundation added that their studies of 4G technologies are very similar.

There were approximately 3,000 animals in the study, and pathologists examined 50 tissues in each animal to look for signs of cancer or other changes.

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Asimina Kiourti, Ph.D., of the Ohio State University, acknowledged the challenge of changing technology. "How to catch up with technology?" she said. "This study delivered 100 percent of what you promised." (Image courtesy of Steve McCaw)

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