Actions from Peer Review of the Draft NTP Technical Reports on Cell Phone Radiofrequency Radiation March 26-28, 2018

The National Toxicology Program (NTP) convened the NTP Technical Reports Peer Review Panel ("the Panel") on March 26-28, 2018, to peer review two *Draft NTP Technical Reports on Cell Phone Radiofrequency Radiation*. Meeting information, including the draft reports, is available at the NTP website (https://ntp.niehs.nih.gov/go/36144). A meeting report will be prepared and posted to the NTP website when completed.

The Panel was divided into two groups. Panel 1 provided consultation on the reverberation chamber technology and Panel 2 provided recommendations on the study findings and NTP's draft conclusions. NTP will consider these comments when finalizing the technical reports. When completed, the technical reports will be published on the NTP website (https://ntp.niehs.nih.gov/go/189).

Panel 1 agreed that the reverberation chamber technology was adequate for generating the fields used to assess the effects of cell phone radiofrequency (RFR) exposure in rats and mice.

Working from NTP's scale of *clear evidence, some evidence, equivocal evidence, and no evidence*, Panel 2 made the following recommendations:

Technical Report TR 596: Cell Phone Radiofrequency Radiation Studies in Mice

Neoplastic Lesions: GSM Modulation

Male B6C3F1/N mice, exposed to GSM-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept (8 yes, 3 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male B6C3F1/N mice based on combined incidences of fibrosarcoma, sarcoma, or malignant fibrous histiocytoma in the skin.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male B6C3F1/N mice based on incidences of alveolar/bronchiolar adenoma or carcinoma (combined) in the lung.

Female B6C3F1/N mice, exposed to GSM-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept (9 yes, 2 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female B6C3F1/N mice based on incidences of malignant lymphoma (all organs).

Neoplastic Lesions: CDMA Modulation

Male B6C3F1/N mice, exposed to CDMA-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept (10 yes, 1 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male B6C3F1/N mice based on incidences of hepatoblastoma in the liver.

Female B6C3F1/N mice, exposed to CDMA-modulated cell phone RFR at 1,900 MHz

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female B6C3F1/N mice based on incidences of malignant lymphoma (all organs).

Nonneoplastic lesions: GSM and CDMA Modulations

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusions as written, *Exposure to GSM- or CDMA-modulated cell phone RFR at 1,900 MHz did not increase the incidence of any nonneoplastic lesions in male or female B6C3F1/N mice*.

Technical Report TR 595: Cell Phone Radiofrequency Radiation Studies in Rats

Neoplastic Lesions: GSM Modulation

Male Hsd:Sprague Dawley SD rats, exposed to GSM-modulated cell phone RFR at 900 MHz

- Panel 2 voted to recommend (8 yes, 3 no, 0 abstentions) the conclusion, ***clear evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant schwannoma in the heart.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma or carcinoma (combined) in the prostate gland.
- Panel 2 voted to recommend (7 yes, 4 no, 0 abstentions) the conclusion, ***some evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant glioma in the brain.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on benign or malignant granular cell tumors in the brain.
- Panel 2 voted to accept (10 yes, 1 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma in the pars distalis of the pituitary gland.
- Panel 2 voted to recommend (6 yes, 4 no, 1 abstention) the conclusion, ***some evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of pheochromocytoma (benign, malignant, or complex combined) in the adrenal medulla.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of pancreatic islet cell adenoma or carcinoma (combined).

Female Hsd:Sprague Dawley SD rats, exposed to GSM-modulated cell phone RFR at 900 MHz

- Panel 2 voted to recommend (9 yes, 2 no, 0 abstentions) the conclusion, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of malignant schwannomas in the heart.

Nonneoplastic Lesions: GSM Modulation

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, *Increases in nonneoplastic lesions in the heart, brain, and prostate gland of male rats occurred with exposures to GSM cell phone RFR at 900 MHz.*
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, *Increases in nonneoplastic lesions in the heart, thyroid gland, and adrenal gland in female rats occurred with exposures to GSM cell phone RFR at 900 MHz.*

Neoplastic Lesions: CDMA Modulation

Male Hsd:Sprague Dawley SD rats, exposed to CDMA-modulated cell phone RFR at 900 MHz

- Panel 2 voted to recommend (8 yes, 3 no, 0 abstentions) the conclusion, ***clear evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant schwannoma in the heart.
- Panel 2 voted to recommend (6 yes, 4 no, 1 abstention) the conclusion, ***some evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of malignant glioma in the brain.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma in the pars distalis of the pituitary gland.
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of male Hsd:Sprague Dawley SD rats based on incidences of adenoma or carcinoma (combined) in the liver.

Female Hsd:Sprague Dawley SD rats, exposed to CDMA-modulated cell phone RFR at 900 MHz

- Panel 2 voted to accept (8 yes, 3 no, 0 abstentions) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of malignant glioma in the brain.
- Panel 2 voted to accept (10 yes, 0 no, 1 abstention) the conclusion as written, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of pheochromocytoma (benign, malignant, or complex combined) in the adrenal medulla.
- Panel 2 voted to recommend (9 yes, 2 no, 0 abstentions) the conclusion, ***equivocal evidence of carcinogenic activity*** of female Hsd:Sprague Dawley SD rats based on incidences of malignant schwannoma in the heart.

Nonneoplastic Lesions: CDMA Modulation

- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, *Increases in nonneoplastic lesions of the heart, brain, and prostate gland occurred in males exposed to CDMA cell phone RFR at 900 MHz.*
- Panel 2 voted to accept unanimously (11 yes, 0 no, 0 abstentions) the conclusion as written, *Increases in nonneoplastic lesions of the brain in females exposed to CDMA cell phone RFR at 900 MHz.*