Comments from Korea
EMF Research Committee of Korean Institute of Electromagnetic Engineering and Science (KIEES)

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Brief introduction of the presenter

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2008~present  Member of the EMF Research Committee of Korean Institute of Electromagnetic Engineering and Science (KIEES), KOREA
2017~Present  President, the Korean Society of Stereotactic and Functional Neurosurgery
2017~Present  Continental Vice president, the World Society of Stereotactic and Functional Neurosurgery
2014~2015  President, Society of Korean Gamma Knife Radiosurgery
1. A draft report, 2016

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 5-19-2016

Several important comments were already appeared in this draft. Since then, those comments have been reviewed and discussed.
1. A draft report, 2016

2. Two draft NTP Technical Reports on Cell Phone RF Radiation.

3. An article (Wyde ME et al, Bioelectromagnetics, Mar 2018)
Introduction

• Tumor of nervous system : classification (brain)

<table>
<thead>
<tr>
<th>Incidence</th>
<th>Primary tumors of the brain</th>
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42 %
- Gliomas
  - Lowest grade tumors (WHO grade I)
    - Pilocytic astrocytoma, Subependymal giant cell astrocytoma, Protoplasmic astrocytoma, Ganglioglioma
    - Xanthomatous astrocytoma, Subependymoma
  - Lower grade malignancies (WHO grade II)
    - Fibrillary (gemistocytic, protoplasmic) astrocytoma, Ependymoma
    - Oligodendroglioma, Mixed oligo-astrocytoma, Optic nerve glioma

(15 %)
- Higher-grade malignancies (WHO grade III)
  - Anaplastic astrocytoma,
  - Anaplastic oligodendroglioma,
  - Anaplastic mixed glioma

36 %
- Meningioma : Benign, Atypical, Malignant
  - Primitive neuroectodermal tumor (PNET) : Medulloblastoma, Ependymoblastoma, Pineoblastoma

15 %
- Pituitary tumors : Pituitary adenoma, pituitary carcinoma, craniopharyngioma, Rathke’s cleft cyst
- Pineal tumors : pineal cyst, pineocytoma, pineoblastoma, Mixed germ cell tumor, Pineal gliomas, Pineal teratoma
- Choroid plexus tumors : Choroid plexus papilloma, Choroid plexus carcinoma
- Other, more benign primary tumors : Neurocytoma, Dysembroplastic neuroepithelial tumor (DNT), Lipoma, Hemangioblastoma, Hamartoma, Teratoma

8 %
- Tumors of nerves and/or nerve sheaths : Neuroma, Schwannoma, Neurofibroma
  - Cysts : Colloid cyst, Arachnoid cysts, Dermoid, Epidermoid, Rathke’s cleft cyst, Pineal cyst
  - Other primary tumors, including skull base ; chondroma, chordoma, sarcoma, gliosarcoma, chondrosarcoma, rhabdomyosarcoma
  - Primary Central Nervous System Lymphoma (PCNSL)

• Metastatic brain tumors and carcinomatous meningitis
Introduction

- Tumor of nervous system: classification (brain)

1. Glioblastoma

- The most common and **most malignant** glial tumor
- Mean age of onset 56-64 years old, more common in men
- Biologically **aggressive**
- Growth pattern: spread into brain parenchyme

- Median survival **12-15 months**

Despite aggressive treatment with surgery, radiation, and chemotherapy, these tumors are **most often rapidly fatal**.
Introduction

• Tumor of nervous system: classification (brain)

1. Glioblastoma

2. Schwannoma

• Benign tumors of nerves and/or nerve sheaths
• Neuroma, Schwannoma, Neurofibroma

3. Cardiac schwannoma

• Primary cardiac schwannoma is an extremely rare
• Worldwide, only 16 cases have been reported
• Case report; Female 55. chest pain at rest

Comments

1. The scale of NTP study was the largest ever. The long-term carcinogenesis animal studies are important to identify human risks.

   The study design was reasonable to perform with two groups including the sham-exposed and the RF-exposed group.

   • However, the sham-exposed group is different from cage-control group.

   → Therefore the data from the historical control group could not be an alternative replacing that from the sham-exposed group.
2. Both glioma and schwannoma (including cardiac schwannoma) are tumors of nervous system.

- Even though cardiac schwannoma is extremely rare in human, the NTP study reports have drawn special attention to tumors of the nervous system.

- If life-span RF exposure may cause increased incidence of tumors of the nervous system, regardless of statistical significance, we have to pay attention to the carcinogenic potential of RFR in human.
Comments

3. This NTP study was well organized.

- Well organized trial does not guarantee the success of the study, especially in *in vivo* experiment.

- The *survival* rate of the sham-exposed group would be the most significant drawback of this study.
Comments

4. The post-NTP study would be necessary to draw a meaningful conclusion.
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