

IARC Implications

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IARC Working Group Review (2011)

1. Cancer in Humans

There is *limited evidence* in humans for the carcinogenicity of radiofrequency radiation.

“Positive associations have been observed between exposure to radiofrequency radiation from wireless phones and glioma, and acoustic neuroma.”

2. Cancer in Experimental Animals

There is *limited evidence* in experimental animals for the carcinogenicity of radiofrequency radiation.

3. Overall Evaluation

Radiofrequency electromagnetic fields are *possibly carcinogenic* to humans (Group 2B).

Why do we now believe RFR *causes* Brain Cancer in humans?

Three important sets of case-control (human) studies of mobile phone use and brain cancer:

- Interphone - 2-fold increased risk after 10+ years use
- Hardell in Sweden – several studies showing 2-5 fold increased risk after prolonged use, especially when exposure began early in life
- Cerenat France, 5-fold increased risk after 5+ years use

These studies all show that the lower the exposure, the less the risk

Interphone – Appendix 2 for Glioma

Time since start of regular use (years)	Cases	Controls	OR	95% CI
1-1.9	93	159	1.00	
2-4	460	451	1.68	1.16-2.41
5-9	468	491	1.52	1.06-2.22
10+	190	150	2.18	1.43-3.31

Relative Risk Estimates for Glioma Associated with Ten or More Years of Mobile Phone Use

Study	Exposure, in years of use	RR/OR	95% CI	Design
Benson et al, 2013 (UK)	>10	0.8	0.5-1.1	Cohort
Hardell et al, 2013 (Sweden)	10-15	1.4	1.3-3.5	Case-control
	>25	3.0	1.7-5.2	

Cerenat (France)– 231 cases, 446 controls (Coureau et al, 2014)

Brain cancer	Exposure period	OR	95% CI
Glioma	After 2 years	2.9	1.4-5.9
	After 3 years	3.0	1.5-6.3
	After 5 years	5.3	2.1-13.2
Ipsilateral glioma	All	2.1	0.7-6.1
Meningioma	All	2.6	1.0-6.1

Relative Risk Estimates for Acoustic Neuroma Associated with Ten or More Years of Mobile Phone Use

Study	Exposure, in years of use	RR/OR	95% CI	Design
Benson et al, 2013 (UK)	>10	2.5	1.1-5.6	Cohort
Hardell et al, 2015 (Sweden)	10-15	2.1	1.3-3.5	Case-control
Moon et al, 2014 (Korea)	≥ 10	1.0	0.9-1.0	Case-control

Case-control study of brain tumors in adolescents using *operator records* for exposure in Nordic countries (Aydin et al. 2011).

Years since initial subscription	Cases	Controls	OR	95% CI
Never regular user	134	259	1.0	
<1.8	19	51	0.8	0.4-1.4
1.8-2.8	19	25	1.7	0.8-3.4
>2.8	24	25	2.2	1.1-4.3
			P=0.001	

Radiofrequency Radiation is probably an avoidable cause of Breast Cancer

7 unusual clinical case reports, supported by:

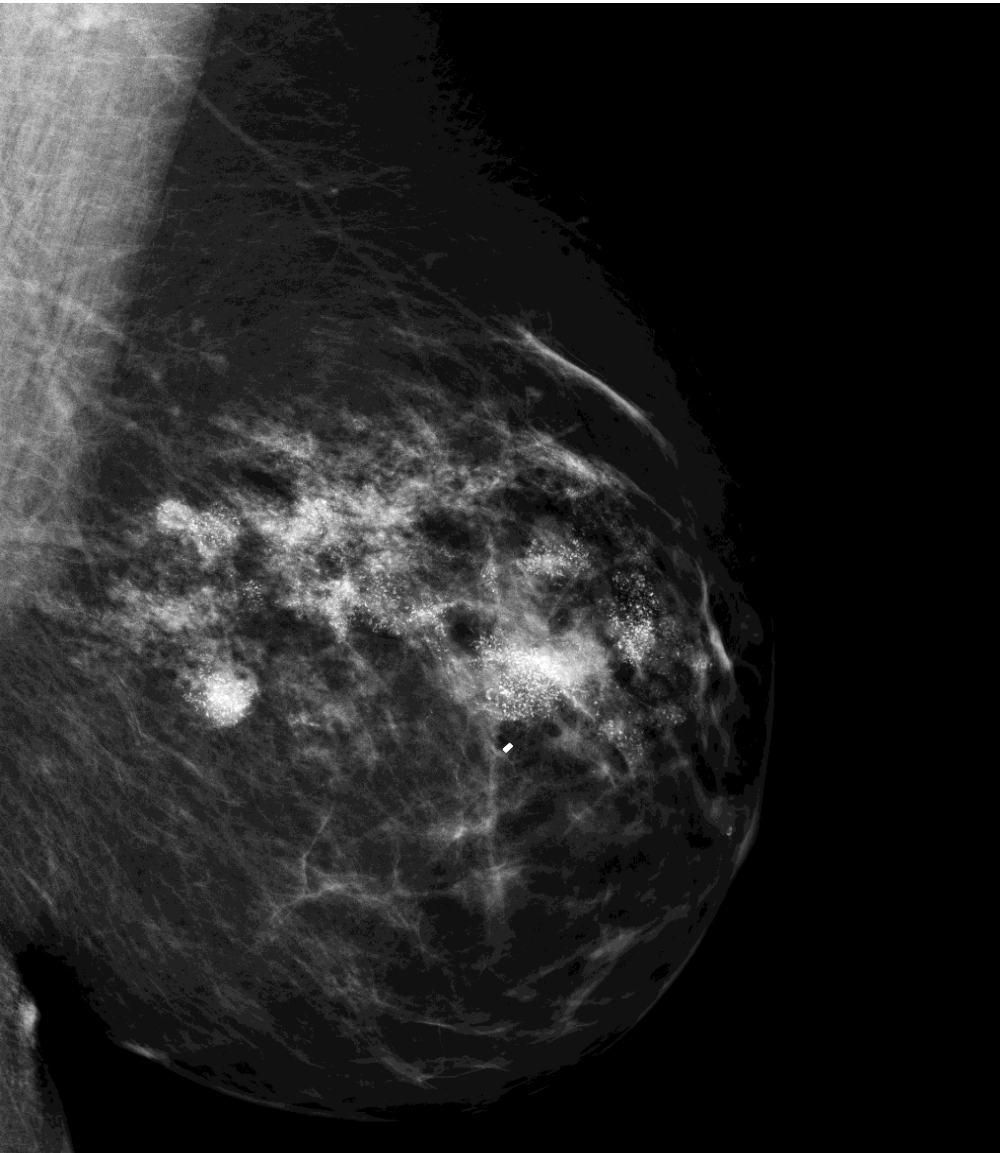
- Exposure modeling

- Toxicology

 - ✧ in vitro with human and animal cells

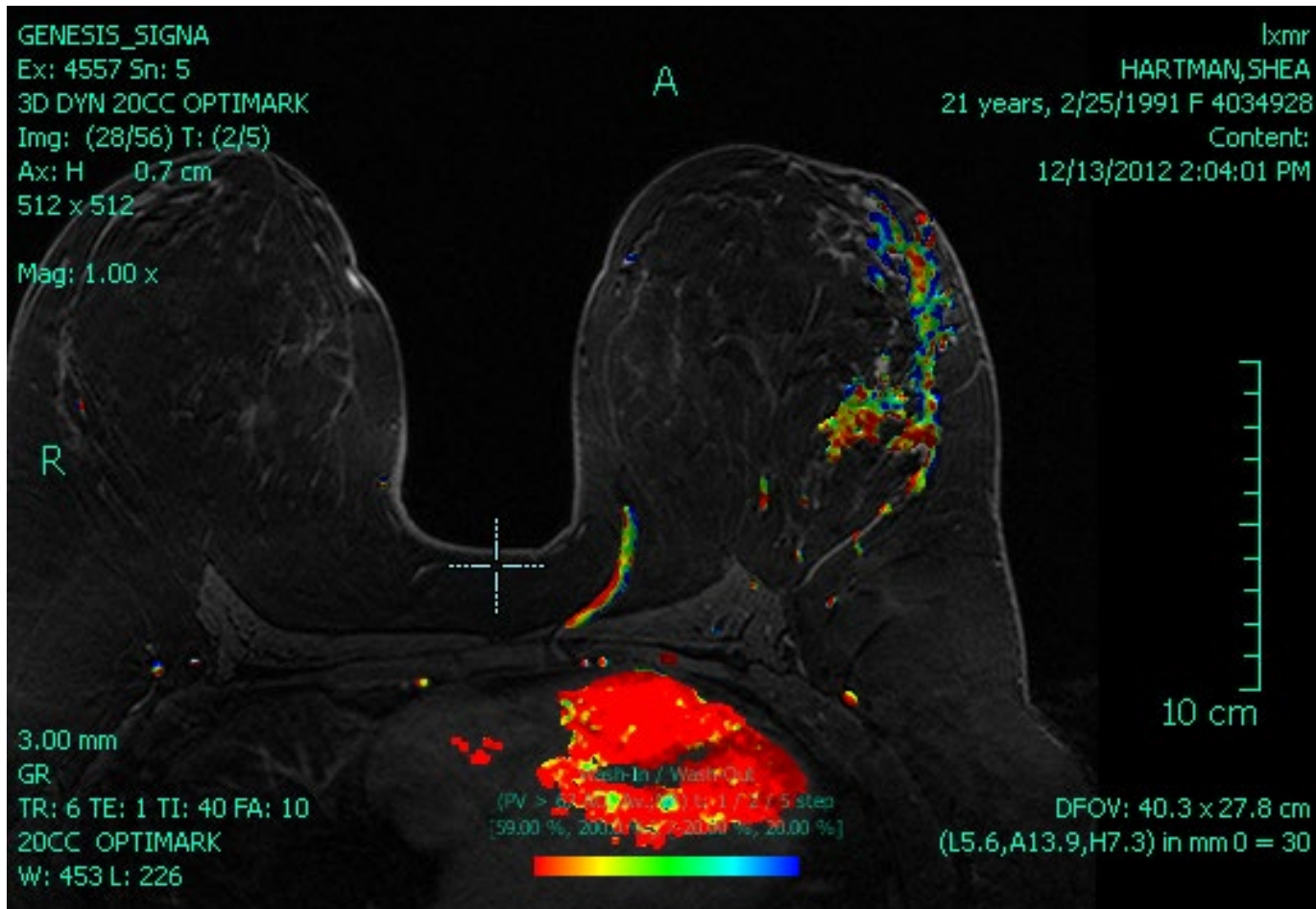
 - ✧ in vivo

First case reported by Robert Nagourney, MD,
2009



Invasive multiple
primary tumors in 34
year old, avid runner,
Chinese-American
woman who had kept a
cellphone 4 hours a
day in her bra for 10
years

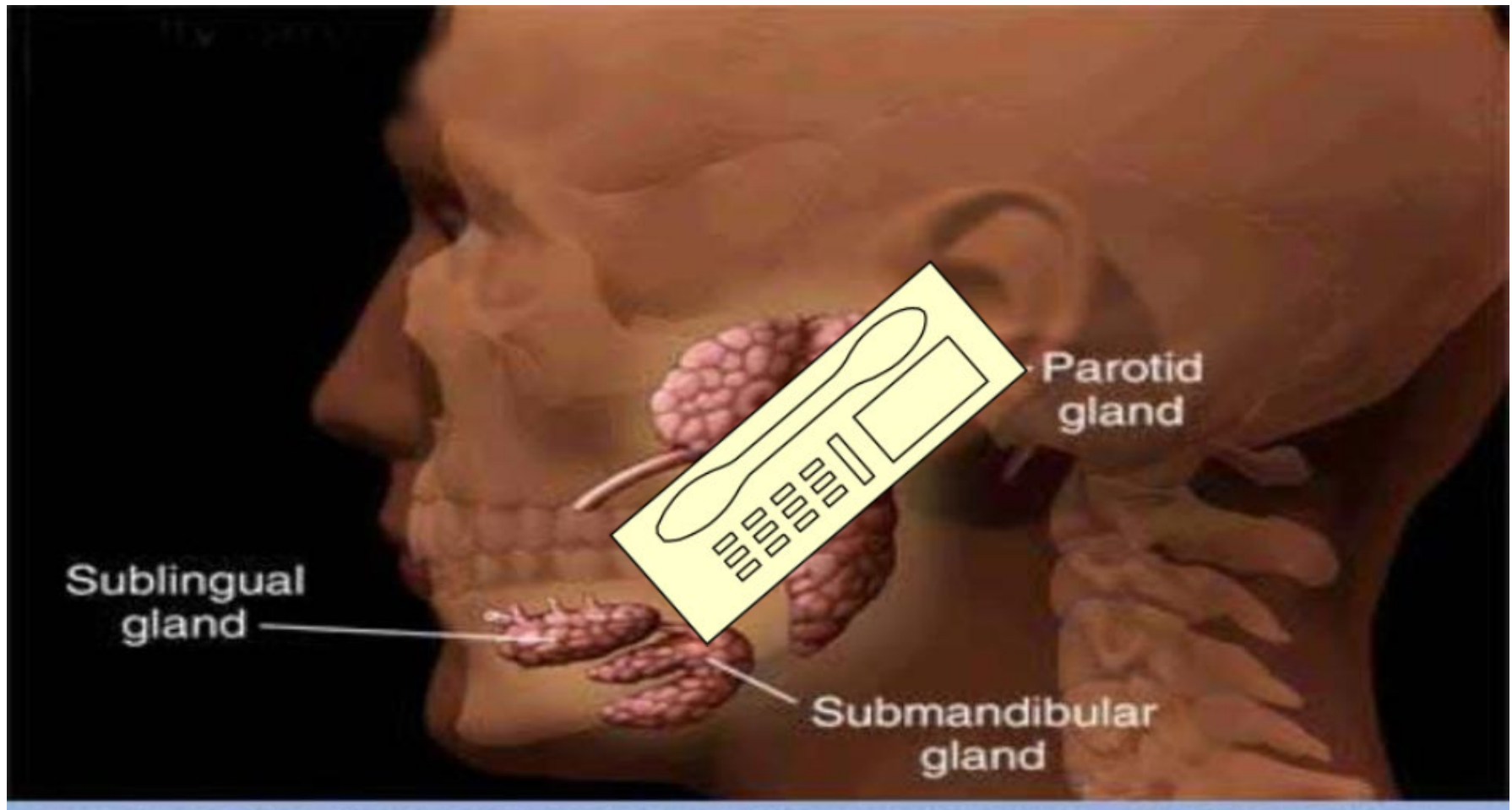
One of 4 case reports—21 yr old. Multi-focal tumors linked to cellphone kept in bra (West et al, 2013)



Other reasons for deducing that radiofrequency radiation causes breast cancer

- Exposure Information
- In vitro toxicology
 - RFR stimulates cell death in normal fibroblasts
 - RFR impedes efficacy of tamoxifen
 - RFR interferes with melatonin
 - RFR is a xenoestrogen
- In vivo toxicology studies

Parotid or Salivary Gland Tumors Tripled in Israel: 1 in 5 under age 20



Increase in Parotid Gland Tumors in Israel over 30 Years

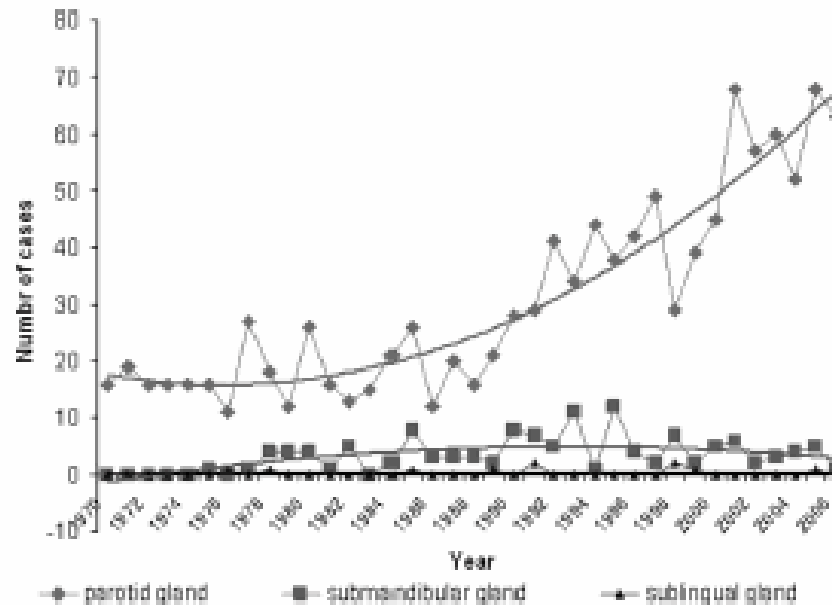
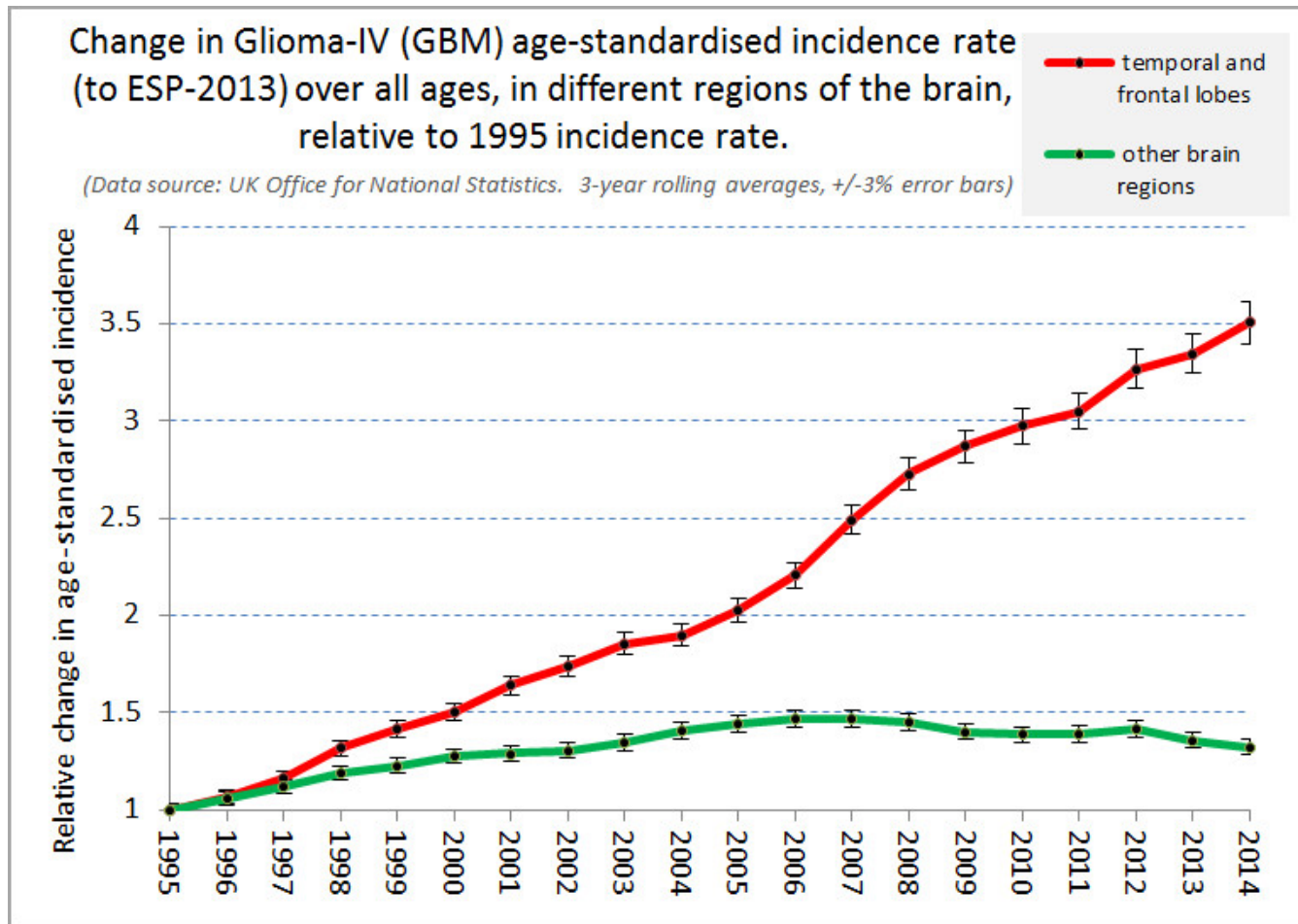


FIGURE. For trend analyses, we added regression lines and calculated R^2 values. Parotid gland cancer: $R^2 = 0.83$; Submandibular gland cancer: $R^2 = 0.36$; Sublingual gland cancer: $R^2 = 0.02$.

Source: Epidemiology, 22, p.130, January 2011

Rise of Glioblastoma in the UK (Philips et al, 2018)



Other reported changes in rates of brain cancer

The incidence of neuro-epithelial brain cancers has significantly increased in children, adolescents, and young adults from birth to 24 years in the United States (Gittleman et al, 2015; Siegel et al 2018).

Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans.

- Tumor-promoting effects of RF-EMF exposed mice were first reported in 2010.
- Lerchl et al (2015) replicated the study with higher numbers of mice per group.
- They could not fully confirm the previous results.
- No clear dose–response relationship was evident.
- Lerchl et al (2015) hypothesized that metabolic changes are responsible for the effects observed.

NTP Animal Carcinogenicity Study

National Toxicology Program (US):

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

- Clear evidence of carcinogenic activity based on incidence of malignant schwannoma in the heart.

- Some evidence of carcinogenic activity based on incidence of malignant glioma in the brain.

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

- Clear evidence of carcinogenic activity based on incidence of malignant schwannoma in the heart.

- Some evidence of carcinogenic activity based on incidence of malignant glioma in the brain.

Multiple organs (e.g., brain, heart) also had evidence of DNA damage.

Ramazzini Institute Life-span Carcinogenic Study

2448 male and female Sprague-Dawley rats had whole-body exposure for 19 h/day to a 1.8 GHz GSM far field of 0, 5, 25, 50 V/m from prenatal life until natural death.

- This reproduced the environmental exposure to RFR generated by 1.8 GHz GSM antenna of radio base stations of mobile phones.

Results:

- A statistically significant increase in the incidence of heart Schwannomas in treated male rats at 50 V/m.
- A non-significant increase in the incidence of heart Schwann cells hyperplasia in treated male and female rats at 50 V/m.
- A non-significant increase in the incidence of malignant glial tumors in treated female rats at 50 V/m.

(Falcioni et al, Environmental Research; 2018)

5G and the Internet of Things (IoT): a Trojan horse (Heroux, 2018)

- *Millions of mini-cell towers soon to be installed every 150 m in our neighbourhoods*
- Will invade the privacy of every home
- **Optical fibre is safer, healthier and faster**
- With optical fibre, everyone could enjoy a communication speed ultimately 10,000 times faster than wireless, less vulnerable to hacking and harmless to the health of humans and other species.

IARC Process from now

- An IARC advisory committee recently recommended that RFR should be re-reviewed with high priority.
- An extensive literary search will be conducted for relevant peer-reviewed publications.
- Members (and chair) of a Working Group will be selected by the IARC Director and the head of the Monographs program
- The working group will be given specific tasks, and then will meet for 8 days in Lyon.

Conclusions

- Radiofrequency radiation is a human and animal Carcinogen (IARC Group 1)
- Government standards must be changed to reflect this
- Radiofrequency radiation is now ubiquitous
- Even if the risk per individual is low, it is widely distributed and could become a major public health problem, especially if the planned introduction of 5G proceeds