Bologna, September 28th, 2018

Ramazzini Institute Animal Study on Base Station/Cell Tower Radiofrequency Radiation

The study entitled "Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz base station environmental emission" and is published online in the peer-reviewed Elsevier journal Environmental Research

What is this study designed to evaluate?
Using established experimental methods that are currently employed to evaluate drugs or toxic agents, this study was designed to test for potential adverse effects, in particular carcinogenic, from the "environmental" radiofrequency radiation (RFR) exposures related to emissions from base stations - the wireless antennas mounted on cell towers. People are exposed, from conception for all the life span, to full body low level RFR every day, from nearby cell towers as well as the multiple wireless devices they use every day. We reproduced the same situation in SD rats, a human equivalent experimental model.

What is the study design?
Male and female Sprague-Dawley rats (2448) were exposed from prenatal life until natural death to a 1.8 GHz GSM modulated far field RFR of 0, 5, 25, and 50 V/m for 19 hours a day. Researchers estimated whole body specific absorption rate (SAR) as 0.001W/kg at 5 V/m , 0.03 W/kg at 25 V/m, and 0.1 W/kg at 50 V/m .

How do the Ramazzini Institute exposure levels compare to exposure to people?
All the values were well *below* US FCC and ICNIRP limits for *both* cell tower RFR and for cell phone RFR.

What are the study findings ?
A statistically significant increase in the incidence of very rare tumors called Schwannomas were observed in male rats at the highest dose. This is the same type of heart tumor found to be increased in the US National Toxicology Program $25 million animal study of cell phone radiation that used far higher exposure levels, tumors involving the same cells of acustic nerve (vestibular) neurinoma in humans when epidemiologically studied..
Note: This paper *only* documents brain and heart findings. Data from the other organs will be published at a later date.

Why is this study so important?
The study provides positive experimental evidence that malignant Schwannomas- a carcinogenic effect- is associated with low level RFR. All of the Ramazzini RFR exposures were at levels the US government considers allowable public exposure- yet a statistically significant increase was still found, establishing that very low non-thermal levels of RFR can cause adverse health effects.

The Ramazzini findings are consistent with and reinforce the results of the National Toxicology Program cell phone RFR study, because both animal studies report increased incidence of schwannomas of the heart in RFR- exposed Sprague-Dawley rats. Furthermore, in humans, vestibular schwannoma referred to as acoustic neuromas have been found to be increased in epidemiological studies of long-term cell phone users. Thus, the same type of tumors have been found in human studies as well as two large scale controlled animal studies- providing strong confirmation of the association.

The NTP and RI have evidenced the hazard of RFR exposure, as regards the risk we have to consider that about 7 billion of people are exposed in the planet, and even if the risk is to be considered low, due to the large number of exposed individuals, we could expect thousands of people affected by serious diseases like cancer of the peripheral nerves and brain.

These experimental studies provide sufficient evidence to call for the re-evaluation of the carcinogenic potential of RFR in humans by the International Agency for the Research on Cancer (IARC) which classified RFR as a Class 2 B "possible" carcinogen in 2011. Several scientists state recent studies including the NTP and RI study would support a higher carcinogenic classification.

What does this mean for the governments and the public?

Governments worldwide need to urgently strengthen regulations with RFR exposure levels to protect the public against non-thermal health effects such as cancer as current RFR limits are based on thermal effects only. Promoting wired infrastructure for telecommunications networks is a critical solution to drastically reduce exposure to the public. Health agencies need to perform a quantitative risk assessment to determine the levels of risk to humans associated with this widespread exposure. Exposures to the public must be limited and reduced as much as possible, especially for children, pregnant women and medically compromised. The public needs greater awareness of how to reduce personal exposures to cell phones and wireless devices. (Examples: Keeping the phone away from the body, using corded phones and wired devices rather than wireless as much as possible.) The private sector should launch a research and development program to develop safer technology products for the marketplace and for telecommunications networks.

Comparison of Studies on Sprague Dawley Rats to Chronic Exposure to Radiofrequency Radiation (RFR)

	National Toxicology Program (NTP)	Ramazzini Institute (RI)
Documents	NTP Draft Technical Report of Cell Phone Radiofrequency Radiation (Rats) 2/2018 Telephone Press Conference (Audio): NTP Draft Conclusions, Transcript, YouTube of Audio **2/1/2018 NIEHS** Press Release	"Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz base station environmental emission"
Summary of Design and findings	A two year study on Sprague-Dawley rats to evaluate the carcinogenic effects of chronic exposure to CDMA and GSM RFR at 900MHz at three exposure levels 1.5 W/Kg, 3 W/Kg and 6 W/Kg SAR to mimic localized exposure from cell phones near the body in animal tissue.	A life-span study on Sprague-Dawley rats to evaluate the carcinogenic effects of chronic exposure to 1.8 GHz GSM at three exposure levels 5 V/m, 25/Vm and 50 V/m reproducing environmental full body exposure to RFR generated by antennas of the radio base stations (cell towers) for mobile phones and wireless devices.
Statistically Significant Finding	**Heart:** A statistically significant increase in heart Schwannoma in male rats. Significantly increased incidences of right ventricular cardiomyopathy in several treatment groups. **Brain**: Increased incidences of malignant glioma in all groups of GSM male rats, and some CDMA groups.	**Heart**: A statistically significant increase in heart Schwannoma in male rats. **Brain**: A non-statistically significant dose dependent increase in the incidence of malignant glial tumors was observed in treated female rats.
Intent of Exposure Design	To test the underlying basis for US regulatory limits on RFR- the hypothesis that non thermal exposures had no adverse biological effects.	To mimic "environmental" RFR exposures from the emissions of cellular base stations (cell towers). All exposures were below FCC and ICNIRP limits.
Frequency	900 MHz RFR at two different modulations: GSM modulation (Global System for Mobile Communications) and CDMA modulation (Code Division Multiple Access)	1.8 GHz radiofrequency radiation at one modulation: GSM (Global System for Mobile Communications)
Exposure Levels/SAR	**Three Exposure Groups + Control** 1.5 W/Kg SAR 3 W/Kg SAR 6 W/Kg SAR	**Three Exposure Groups + Control** 5 V/m, 0.001 SAR estimated 25V/m, 0.03 SAR estimated 50 V/m, 0.1 SAR estimated
Exposure Groups	**14 Total exposure groups** **C**ontrols (male and female) plus three levels of time-averaged whole-body SARs of 1.5, 3, and 6 W/kg 900 MHz at GSM and at CDMA RFR.	**8 Total exposure groups** Controls (male and female) plus three power levels of whole body GSM modulation 0,5,25,50 V/m at the 1800 MHz.
Size of study groups	90 animals in each group received 2 years (104 weeks) of exposure. The groups started larger with 105 male and 105 females. After 14 weeks of exposure, 10 rats per group were randomly selected for interim evaluation.	Control: 412 Males and 405 Females =817 Total 5V/m: 401 Males and 410 Females = 811 Total 25/V/m: 209 Males and 202 Females =411 Total 50/V/m: 207 Males and 202 Females =409 Total
Exposure began	5th day of gestation	12th day of gestation
Animal sacrificed	At 104 weeks: At two years old, after about two-thirds of the rat lifespan, corresponding to about 60 years in humans.	At natural death of the animal.
Daily exposure duration	**Total:** 9 hours and ten minutes a day for 7 days a week Note: The daily exposure was 10 mins on and 10 mins off	**Total:** 19 hours a day of continuous exposure, 7 days/week. Note: The NTP tuned the exposure on and off every ten

	over an 18-hour and 20-minute period each day for 7 days/week. This intermittent exposure resulted in a total of 9 hours and 10 minutes a day, simulating the near field exposure with mobile phone..	minutes but the RI had continuous exposure (at much lower levels) for 19 hours a day, simulating the far field exposure.