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To whom it may concern,

I am writing to express my opinion and concern on the possible health effects of exposure to radiofrequency radiation from wireless transmission devices (e.g., cell phone, Wi-Fi, etc).

The level (intensity) of radiation from a transmitter that one would be exposed to is very low. The level is generally considered to be harmless. Most research in this area deals with radiation of much higher levels. However, some recent studies have suggested that exposure to low-level fields is not completely safe. A list of biological studies on low-level effects is attached with this letter. Many of these studies reported effects, e.g., brain cell damage, DNA damage, and learning deficit that could potentially lead to serious adverse health effects.

Furthermore, when considering the health effect of radiation from wireless transmitters, one has to consider the effect of long-term exposure. People who use these devices are constantly being exposed to the radiation for months or years. Even though the level is low, it would matter if the effects of radiofrequency radiation turn out to be cumulative (i.e., add up over time). Small doses cumulate over a long period of time will eventually lead to harmful effects. Most of the studies in the attached list only investigated short term exposure effects and little is known about long-term exposure.

Therefore, exposure of the general public to radiofrequency radiation from wireless transmitters should be limited to a minimal.

Sincerely,

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## **Studies reporting biological effects of radiofrequency radiation (RFR) at low intensities**

- (1) Balode (1996)- blood cells from cows from a farm close and in front of a radar showed significantly higher level of severe genetic damage.**
- (2) Belyaev et al. (2005)- cell phone radiation at SAR of 0.037 W/kg caused genetic changes in human white blood cells.**
- (3) Boscol et al. (2001)- RFR from radio transmission stations (0.005 mW/cm<sup>2</sup>) affected immunological system in women.**
- (4) Capri et al. (2004)- cell phone radiation at SAR range of 0.070 – 0.076 W/kg affected cell proliferation and membrane chemistry.**
- (5) Chiang et al. (1989)- people lived and worked near radio antennae and radar installations showed deficits in psychological and short-term memory tests.**
- (6) de Pomerai et al. (2000, 2002)- reported an increase in a molecular stress response in cells after exposure to a RFR at a SAR of 0.001 W/kg. This stress response is a basic biological process that is present in almost all animals - including humans.**
- (7) de Pomerai et al. (2003)- RFR damages proteins at 0.015-0.020 W/kg.**
- (8) D'Inzeo et al. (1988)- very low intensity RFR (0.002 – 0.004 mW/cm<sup>2</sup>) affected the operation of acetylcholine-related ion-channels in cells. These channels play important roles in physiological and behavioral functions.**
- (9) Dolk et al. (1997)- a significant increase in adult leukemias was found in residence who lived near the Sutton Coldfield television (TV) and frequency modulation (FM) radio transmitter in England.**
- (10) Dutta et al. (1989)- reported an increase in calcium efflux in cells after exposure to RFR at 0.005 W/kg. Calcium is an important component of normal cellular functions.**
- (11) Eger et al. (2004)- increase in cancer risk of people lived in the proximity of a cell phones tower.**
- (12) Fesenko et al. (1999)- reported a change in immunological functions in mice after exposure to RFR at a power density of 0.001 mW/cm<sup>2</sup>.**

- (13) **Forgacs et al. (2006)**- repeated exposure to cell phone radiation at SAR of 0.018-0.023 W/kg caused an increase in serum testosterone in mice.
- (14) **Ha et al. (2003)**- increase in cancer rate in people who lived within 2 km of a AM radio transmitter.
- (15) **Ha et al. (2007)**- increase in childhood leukemia within 2 km of AM radio transmitters.
- (16) **Hjollund et al. (1997)**- sperm counts of Danish military personnel, who operated mobile ground-to-air missile units that use several RFR emitting radar systems (maximal mean exposure 0.01 mW/cm<sup>2</sup>), were significantly low compared to references.
- (17) **Hocking et al. (1996)**- an association was found between increased childhood leukemia incidence and mortality and proximity to TV towers.
- (18) **Ivaschuk et al. (1999)**- short-term exposure to cellular phone RFR of very low SAR (0.026 W/kg) affected a gene related to cancer.
- (19) **Jech et al. (2001)**- cell phone radiation at SAR of 0.06 W/kg improved cognitive function in humans.
- (20) **Kolodynski and Kolodynska (1996)**- school children lived in front of a radio station had less developed memory and attention, their reaction time was slower, and their neuromuscular apparatus endurance was decreased.
- (21) **Kwee et al. (2001)**- 20 minutes of cell phone RFR exposure at 0.0021 W/kg increased stress protein in human cells.
- (22) **Lebedeva et al. (2000)**- brain wave activation was observed in human subjects exposed to cellular phone RFR at 0.06 mW/cm<sup>2</sup>.
- (23) **Lerchl et al. (2008)**- chronic exposure to cell phone radiation at SAR of 0.08 W/kg caused metabolic changes in hamsters.
- (24) **Loscher and Kas (1998)**- exposure to radiation from a radio transmission antenna caused abnormal behaviors in a dairy cow herd.
- (25) **Magras and Xenos (1999)**- reported a decrease in reproductive function in mice exposed to RFR at power densities of 0.000168 - 0.001053 mW/cm<sup>2</sup>.

- (26) Mann et al. (1998)- a transient increase in blood cortisol was observed in human subjects exposed to cellular phone RFR at 0.02 mW/cm<sup>2</sup>. Cortisol is a hormone involved in stress reaction.
- (27) Marinelli et al. (2004)- exposure to 900-MHz RFR at 0.0035 W/kg affected cell's self-defense responses.
- (28) Michelozzi et al. (1998)- leukemia mortality within 3.5 km (5,863 inhabitants) near a high power radio-transmitter in a peripheral area of Rome was higher than expected.
- (29) Michelozzi et al. (2002)- childhood leukemia higher at a distance up to 6 km from a radio station.
- (30) Navakatikian and Tomashevskaya (1994)- RFR at low intensities (0.01 - 0.1 mW/cm<sup>2</sup>; 0.0027- 0.027 W/kg) induced behavioral and endocrine changes in rats. Decreases in blood concentrations of testosterone and insulin were reported.
- (31) Nittby et al. (2007)- long term exposure to cell phone radiation (SAR 0.0006 – 0.06 W/kg) reduced memory functions in rats.
- (32) Novoselova et al. (1999)-low intensity RFR (0.001 mW/cm<sup>2</sup>) affected functions of the immune system.
- (33) Novoselova et al. (2004)- chronic exposure to RFR (0.001 mW/cm<sup>2</sup>) decreased tumor growth rate and enhanced survival in mice.
- (34) Park et al. (2004)- higher mortality rates for all cancers and leukemia in some age groups in the area near AM radio broadcasting towers.
- (35) Persson et al. (1997)- reported an increase in the permeability of the blood-brain barrier in mice exposed to RFR at 0.0004 - 0.008 W/kg. The blood-brain barrier envelops the brain and protects it from toxic substances.
- (36) Phillips et al. (1998)- reported DNA damage in cells exposed to RFR at SAR of 0.0024 - 0.024 W/kg.
- (37) Polonga-Moraru et al. (2002)- change in membrane of cells in the retina (eye) after exposure to RFR at 15 μW/cm<sup>2</sup>.
- (38) Pyrpasopoulou et al. (2004)- exposure to cell phone radiation during early gestation at SAR of 0.0005 W/kg (5 μW/cm<sup>2</sup>) affected kidney development in rats.

- (39) Salford et al. (2003)- nerve cell damage in brain of rats exposed for 2 hrs to GSM signal at 0.02 W/kg.
- (40) Santini et al. (2002)- increase in complaint frequencies for tiredness, headache, sleep disturbance, discomfort, irritability, depression, loss of memory, dizziness, libido decrease, in people who lived within 300 m of mobile phone base stations.
- (41) Sarimov et al. (2004)- cell phone microwaves affected human lymphocyte chromatin similar to stress response at 0.0054 W/kg.
- (42) Schwartz et al. (1990)- calcium movement in the heart affected by RFR at SAR of 0.00015 W/kg. Calcium is important in muscle contraction. Changes in calcium can affect heart functions.
- (43) Somosy et al. (1991)- RFR at 0.024 W/kg caused molecular and structural changes in cells of mouse embryos.
- (44) Stagg et al. (1997)- glioma cells exposed to cellular phone RFR at 0.0059 W/kg showed significant increases in thymidine incorporation, which may be an indication of an increase in cell division.
- (45) Stankiewicz et al. (2006)- cell phone radiation at SAR of 0.024 W/kg affected immune activities of white blood cells.
- (46) Stark et al. (1997)- a two- to seven-fold increase of salivary melatonin concentration was observed in dairy cattle exposed to RFR from a radio transmitter antenna.
- (47) Tattersall et al. (2001)- low-intensity RFR (0.0016 - 0.0044 W/kg) modulated the function of a part of the brain called the hippocampus, in the absence of gross thermal effects. The changes in excitability may be consistent with reported behavioral effects of RFR, since the hippocampus is involved in learning and memory.
- (48) Vangelova et al. (2002)- operators of satellite station exposed to low dose (0.1127 J/kg) of RFR over a 24-hr shift showed an increased excretion of stress hormones.
- (49) Velizarov et al. (1999)- showed a decrease in cell proliferation (division) after exposure to RFR of 0.000021 - 0.0021 W/kg.
- (50) Veyret et al. (1991)- low intensity RFR at SAR of 0.015 W/kg affected functions of the immune system.

- (51) Wolke et al. (1996)- RFR at 0.001W/kg affected calcium concentration in heart muscle cells of guinea pigs.**
- (52) Yurekli et al. (2006)- cell phone radiation at SAR of 0.0113 W/kg affected free radical chemistry in the rat.**