Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		**Reference**
As low as (10^{-13}) or 100 femtowatts/cm2	Super-low intensity RFR effects at MW reasonant frequencies resulted in changes in genes; problems with chromatin conformation (DNA)	Belyaev, 1997
5 picowatts/cm2 (10^{-12})	Changed growth rates in yeast cells	Grundler, 1992
0.1 nanowatt/cm2 (10^{-10}) or 100 picowatts/cm2	Super-low intensity RFR effects at MW reasonant frequencies resulted in changes in genes; problems with chromatin condensation (DNA) intensities comparable to base stations	Belyaev, 1997
0.00034 uW/cm2	Chronic exposure to mobile phone pulsed RF significantly reduced sperm count,	Behari, 2006
0.0005 uW/cm2	RFR decreased cell proliferation at 960 MHz GSM 217 Hz for 30-min exposure	Velizarov, 1999
0.0006 - 0.0128 uW/cm2	Fatigue, depressive tendency, sleeping disorders, concentration difficulties, cardio- vascular problems reported with exposure to GSM 900/1800 MHz cell phone signal at base station level exposures.	Oberfeld, 2004
0.0009 uW/cm2	RFR induced 10%-40% increase in DNA synthesis in glioma cells (brain)	Stagg, 1997
0.003 - 0.02 uW/cm2	In children and adolescents (8-17 yrs) short-term exposure caused headache, irritation, concentration difficulties in school.	Heinrich, 2010
0.003 to 0.05 uW/cm2	In children and adolescents (8-17 yrs) short-term exposure caused conduct problems in school (behavioral problems)	Thomas, 2010
0.005 uW/cm2	In adults (30-60 yrs) chronic exposure caused sleep disturbances, (but not significantly increased across the entire population)	Mohler, 2010
0.005 - 0.04 uW/cm2	Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated)	Thomas, 2008
0.006 - 0.01 uW/cm2	Chronic exposure to base station RF (whole-body) in humans showed increased stress hormones; dopamine levels substantially decreased; higher levels of adrenaline and nor-adrenaline; dose-response seen; produced chronic physiological stress in cells even after 1.5 years.	Buchner, 2012
0.01 - 0.11 uW/cm2	RFR from cell towers caused fatigue, headaches, sleeping problems	Navarro, 2003

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
0.01 - 0.05 uW/cm2	Adults (18-91 yrs) with short-term exposure to GSM cell phone radiation reported headache, neurological problems, sleep and concentration problems.	Hutter, 2006
0.005 - 0.04 uW/cm2	Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated)	Thomas, 2008
0.015 - 0.21 uW/cm2	Adults exposed to short-term GSM 900 radiation reported changes in mental state (e.g., calmness) but limitations of study on language descriptors prevented refined word choices (stupified, zoned-out)	Augner, 2009
0.05 - 0.1 uW/cm2	RFR linked to adverse neurological, cardio symptoms and cancer risk	Khurana, 2010
0.05 - 0.1 uW/cm2	RFR related to headache, concentration and sleeping problems, fatigue	Kundi, 2009
0.07 - 0.1 uW/cm2	Sperm head abnormalities in mice exposed for 6-months to base station level RF/MW. Sperm head abnormalities occurred in 39% to 46% exposed mice (only 2% in controls) abnormalities was also found to be dose dependent. The implications of the pin-head and banana-shaped sperm head. The occurrence of sperm head observed increase occurrence of sperm head abnormalities on the reproductive health of humans living in close proximity to GSM base stations were discussed."	Otitoloju, 2010
0.38 uW/cm2	RFR affected calcium metabolism in heart cells	Schwartz, 1990
0.8 - 10 uW/cm2	RFR caused emotional behavior changes, free-radical damage by super-weak MWs	Akoev, 2002
0.13 uW/cm2	RFR from 3G cell towers decreased cognition, well-being	Zwamborn, 2003
0.16 uW/cm2	Motor function, memory and attention of school children affected (Latvia)	Kolodynski, 1996
0.168 - 1.053 uW/cm2	Irreversible infertility in mice after 5 generations of exposure to RFR from an 'antenna park'	Magras & Zenos, 1997
0.2 - 8 uW/cm2	RFR caused a two-fold increase in leukemia in children	Hocking, 1996
0.2 - 8 uW/cm2	RFR decreased survival in children with leukemia	Hocking, 2000
0.21 - 1.28 uW/cm2	Adolescents and adults exposed only 45 min to UMTS cell phone radiation reported increases In headaches.	Riddervold, 2008

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
0.5 uW/cm2	Significant degeneration of seminiferous epithelium in mice at 2.45 GHz, 30-40 min.	Saunders, 1981
0.5 - 1.0 uW/cm2	Wi-FI level laptop exposure for 4-hr resulted in decrease in sperm viability, DNA fragmentation with sperm samples placed in petri dishes under a laptop connected via WI-FI to the internet.	Avendano, 2012
1.0 uW/cm2	RFR induced pathological leakage of the blood-brain barrier	Persson, 1997
1.0 uW/cm2	RFR caused significant effect on immune function in mice	Fesenko, 1999
1.0 uW/cm2	RFR affected function of the immune system	Novoselova, 1999
1.0 uW/cm2	Short-term (50 min) exposure in electrosensitive patients, caused loss of well-being after GSM and especially UMTS cell phone radiation exposure	Eltiti, 2007
1.3 - 5.7 uW/cm2	RFR associated with a doubling of leukemia in adults	Dolk, 1997
1.25 uW/cm2	RFR exposure affected kidney development in rats (in-utero exposure)	Pyrpasopoulou, 2004
1.5 uW/cm2	RFR reduced memory function in rats	Nittby, 2007
2 uW/cm2	RFR induced double-strand DNA damage in rat brain cells	Kesari, 2008
2.5 uW/cm2	RFR affected calcium concentrations in heart muscle cells	Wolke, 1996
2 - 4 uW/cm2	Altered cell membranes; acetycholine-induced ion channel disruption	D'Inzeo, 1988
4 uW/cm2	RFR caused changes in hippocampus (brain memory and learning)	Tattersall, 2001
4 - 15 uW/cm2	Memory impairment, slowed motor skills and retarded learning in children	Chiang, 1989
5 uW/cm2	RFR caused drop in NK lymphocytes (immune function decreased)	Boscolo, 2001
5.25 uW/cm2	20 minutes of RFR at cell tower frequencies induced cell stress response	Kwee, 2001
5 - 10 uW/cm2	RFR caused impaired nervous system activity	Dumansky, 1974
6 uW/cm2	RFR induced DNA damage in cells	Phillips, 1998

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
8.75 uW/cm2	RFR at 900 MHz for 2-12 hours caused DNA breaks in leukemia cells	Marinelli, 2004
10 uW/cm2	Changes in behavior (avoidance) after 0.5 hour exposure to pulsed RFR	Navakatikian, 1994
10 - 100 uW/cm2	Increased risk in radar operators of cancer; very short latency period; dose response to exposure level of RFR reported.	Richter, 2000
12.5 uW/cm2	RFR caused calcium efflux in cells - can affect many critical cell functions	Dutta, 1989
13.5 uW/cm2	RFR affected human lymphocytes - induced stress response in cells	Sarimov, 2004
14.75 uW/cm2	RFR increased biomarker for cell division in glioma brain tumor cells	Stagg, 1997
20 uW/cm2	Increase in serum cortisol (a stress hormone)	Mann, 1998
28.2 uW/cm2	RFR increased free radical production in rat cells	Yurekli, 2006
37.5 uW/cm2	Immune system effects - elevation of PFC count (antibody producing cells	Veyret, 1991
45 uW/cm2	Pulsed RFR affected serum testosterone levels in mice	Forgacs, 2006
50 uW/cm2	Cell phone RFR caused a pathological leakage of the blood-brain barrier in 1 hour	Salford, 2003
50 uW/cm2	An 18% reduction in REM sleep (important to memory and learning functions)	Mann, 1996
60 uW/cm2	RFR caused structural changes in cells of mouse embryos	Somozy, 1991
60 uW/cm2	Pulsed RFR affected immune function in white blood cells	Stankiewicz, 2006
60 uW/cm2	Cortex of the brain was activated by 15 minutes of 902 MHz cell phone	Lebedeva, 2000
65 uW/cm2	RFR affected genes related to cancer	Ivaschuk, 1999
92.5 uW/cm2	RFR caused genetic changes in human white blood cells	Belyaev, 2005
100 uW/cm2	Changes in immune function	Elekes, 1996
100 uW/cm2	A 24.3% drop in testosterone after 6 hours of CW RFR exposure	Navakatikian, 1994

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
120 uW/cm2	A pathological leakage in the blood-brain barrier with 915 MHz cell RF	Salford, 1994
500 uW/cm2	Intestinal epithelial cells exposed to 2.45 GHz pulsed at 16 Hz showed changes in intercellular calcium.	Somozy, 1993
500 uW/cm2	A 24.6% drop in testosterone and 23.2% drop in insulin after 12 hrs of pulsed RFR exposure.	Navakatikian, 1994
STANDARDS		
530 - 600 uW/cm2	Limit for uncontrolled public exposure to 800-900 MHz	ANSI/IEEE and FCC
1000 uW/cm2	PCS STANDARD for public exposure (as of September 1,1997)	FCC, 1996
5000 uW/cm2	PCS STANDARD for occupational exposure (as of September 1, 1997)	FCC, 1996
BACKGROUND LEVELS		
0.003 uW/cm2	Background RF levels in US cities and suburbs in the 1990s	Mantiply, 1997
0.05 uW/cm2	Median ambient power density in cities in Sweden (30-2000 MHz)	Hamnierius, 2000
0.1 - 10 uW/cm2	Ambient power density within 100-200' of cell site in US (data from 2000)	Sage, 2000

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure

(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

SAR (Watts/Kilogram)		Reference
0.000064 - 0.000078 W/Kg	Well-being and cognitive function affected in humans exposed to GSM-UMTS cell phone frequencies; RF levels similar near cell sites	TNO Physics and
0.00015 - 0.003 W/Kg	Calcium ion movement in isolated frog heart tissue is increased 18% (P<.01) and by 21% (P<.05) by weak RF field modulated at 16 Hz	Schwartz, 1990
0.000021 - 0.0021 W/Kg	Changes in cell cycle; cell proliferation (960 MHz GSM mobile phone)	Kwee, 1997
0.0003 - 0.06 W/Kg	Neurobehavioral disorders in offspring of pregnant mice exposed in utero to cell phones - dose-response impaired glutamatergic synaptic transmission onto layer V pyramidal neurons of the prefrontal cortex. Hyperactivity and impaired memory function in offspring. Altered brain development.	Aldad, 2012
0.0009 W/Kg	Changes in brain glial cells with TDMA 836.55 MHz frequency	Stagg, 1997
0.0016 - 0.0044 W/Kg	Very low power 700 MHz CW affects excitability of hippocampus tissue, consistent with reported behavioral changes.	Tattersall, 2001
0.0021 W/Kg	Heat shock protein HSP 70 is activated by very low intensity microwave exposure in human epithelial amnion cells	Kwee, 2001
0.0024 - 0.024 W/Kg	Digital cell phone RFR at very low intensities causes DNA damage in human cells; both DNA damage and impairment of DNA is reported	Phillips, 1998
0.0027 W/Kg	Changes in active avoidance conditioned behavioral effect is seen after one-half hour of pulsed radiofrequency radiation	Navakatikian, 1994
0.0035 W/Kg	900 MHz cell phone signal induces DNA breaks and early activation of p53 gene; short exposure of 2-12 hours leads cells to acquire greater survival chance - linked to tumor agressiveness.	Marinelli, 2004
0.0095 W/Kg	MW modulated at 7 Hz produces more errors in short-term memory functioin on complex tasks (can affect cognitive processes such as attention and memory)	Lass, 2002
0.001 W/Kg	750 MHz continuous wave (CW) RFR exposure caused increase in heat shock protein (stress proteins). Equivalent to what would be induced by 3 degree C. heating of tissue (but no heating occurred)	De Pomerai, 2000

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
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SAR (Watts/Kilogram)		Reference
0.001 W/Kg	Statistically significant change in intracellular calcium concentration in heart muscle cells exposed to RFR (900 MHz/50 Hz modulation)	Wolke, 1996
0.0021 W/Kg	A significant change in cell proliferation not attributable to thermal heating. RFR induces non-thermal stress proteins (960 MHz GSM)	Velizarov, 1999
0.004 - 0.008 W/Kg	915 MHz cell phone RFR caused pathological leakage of blood-brain barrier. Worst at lower SAR levels and worse with CW compared to Frequency of pathological changes was 35% in rats exposed to pulsed radiation at 50% to continuous wave RFR. Effects observed at a specific absorption (SA) of > 1.5 joules/Kg in human tissues	Persson, 1997
0.0059 W/Kg	Cell phone RFR induces glioma (brain cancer) cells to significantly increase thymidine uptake, which may be indication of more cell division	Stagg, 1997
0.014 W/Kg	Sperm damage from oxidative stress and lowered melatonin levels resulted from 2-hr per day/45 days exposure to 10 GHz.	Kumar, 2012
0.015 W/Kg	Immune system effects - elevation of PFC count (antibody-producing cells)	Veyret, 1991
0.02 W/Kg	A single, 2-hr exposure to GSM cell phone radiation results in serious neuron damage (brain cell damage) and death in cortex, hippocampus, and basal ganglia of brain- even 50+ days later blood-brain barrier is still leaking albumin (P<.002) following only one cell phone exposure	Salford, 2003
0.026 W/Kg	Activity of c-jun (oncogene or cancer gene) was altered in cells after 20 minutes exposure to cell phone digital TDMA signal	Ivaschuk, 1997
0.0317 W/Kg	Decrease in eating and drinking behavior	Ray, 1990
0.037 W/Kg	Hyperactivity caused by nitric oxide synthase inhibitor is countered by exposure to ultra-wide band pulses (600/sec) for 30 min	Seaman, 1999
0.037 - 0.040 W/Kg	A 1-hr cell phone exposure causes chromatin condensation; impaired DNA repair mechanisms; last 3 days (longer than stress response) the effect reaches saturation in only one hour of exposure; electro- sensitive (ES) people have different response in formation of DNA repair foci, compared to healthy individuals; effects depend on carrier frequency (915 MHz = 0.037 W/Kg but 1947 MHz = 0.040 W/Kg)	Belyaev, 2008

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

SAR (Watts/Kilogram)		Reference
0.05 W/Kg	Significant increase in firing rate of neurons (350%) with pulsed 900 MHz cell phone radiation exposure (but not with CW) in avian brain cells	Beason, 2002
0.09 W/Kg	900 MHz study of mice for 7 days, 12-hr per day (whole-body) resulted in significant effect on mitochondria and genome stability	Aitken, 2005
0.091 W/Kg	Wireless internet 2400 MHz, 24-hrs per day/20 weeks increased DNA damage and reduced DNA repair; levels below 802.11 g Authors say "findings raise questions about safety of radiofrequency exposure from Wi-Fi internet access devices for growing organisms of reproductive age, with a potential effect on fertility and integrity of germ cells" (male germ cells are the reproductive cells=sperm)	Atasoy, 2012
0.11 W/Kg	Increased cell death (apoptosis) and DNA fragmentation at 2.45 GHz for 35 days exposure (chronic exposure study)	Kesari, 2010
0.121 W/Kg	Cardiovascular system shows significant decrease in arterial blood pressure (hypotension) after exposure to ultra-wide band pulses	Lu, 1999
0.13 - 1.4 W/Kg	Lymphoma cancer rate doubled with two 1/2-hr exposures per day of cell phone radiation for 18 months (pulsed 900 MHz cell signal)	Repacholi, 1997
0.14 W/Kg	Elevation of immune response to RFR exposure	Elekes, 1996
0.141 W/Kg	Structural changes in testes - smaller diameter of seminiferous	Dasdag, 1999
0.15 - 0.4 W/Kg	Statistically significant increase in malignant tumors in rats chronically exposed to RFR	Chou, 1992
0.26 W/Kg	Harmful effects to the eye/certain drugs sensitize the eye to RFR	Kues, 1992
0.28 - 1.33 W/Kg	Significant increase in reported headaches with increasing use of hand-held cell phone use (maximum tested was 60 min per day)	Chia, 2000
0.3 - 0.44 W/Kg	Cell phone use results in changes in cognitive thinking/mental tasks related to memory retrieval	Krause, 2000
0.3 - 0.44 W/Kg	Attention function of brain and brain responses are speeded up	Preece, 1999
0.3 - 0.46 W/Kg	Cell phone RFR doubles pathological leakage of blood-brain barrier permeability at two days (P=.002) and triples permeability at four days (P=.001) at 1800 MHz GSM cell phone radiation	Schirmacher, 2000

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

SAR (Watts/Kilogram)		Reference
0.43 W/Kg	Significant decrease in sperm mobility; drop in sperm concentration; and decrease in seminiferous tubules at 800 MHz, 8-hr/day, 12 weeks, with mobile phone radiation level on STANDBY ONLY (in rabbits)	Salama, 2008
0.5 W/Kg	900 MHz pulsed RF affects firing rate of neurons (Lymnea stagnalis) but continuous wave had no effect	Bolshakov, 1992
0.58 - 0.75 W/Kg	Decrease in brain tumors after chronic exposure to RFR at 836 MHz	Adey, 1999
0.6 - 0.9 W/Kg	Mouse embryos develop fragile cranial bones from in utero 900 MHz The authors say "(O)ur results clearly show that even modest exposure (e.g., 6 min daily for 21 days" is sufficient to interfere with the normal mouse developmental process"	Fragopoulou, 2009
0.6 and 1.2 W/Kg	Increase in DNA single and double-strand DNA breaks in rat brain cells with exposure to 2450 MHz RFR	Lai & Singh, 1996
0.795 W/Kg	GSM 900 MHz, 217 Hz significantly decreases ovarian development and size of ovaries, due to DNA damage and premature cell death of nurse cells and follicles in ovaries (that nourish egg cells)	Panagopoulous, 2012
0.87 W/Kg	Altered human mental performance after exposure to GSM cell phone radiation (900 MHz TDMA digital cell phone signal)	Hamblin, 2004
0.87 W/Kg	Change in human brainwaves; decrease in EEG potential and statistically significant change in alpha (8-13 Hz) and beta (13-22 Hz) brainwave activity in humans at 900 MHz; exposures 6/min per day for 21 days (chronic exposure)	D'Costa, 2003
0.9 W/Kg	Decreased sperm count and more sperm cell death (apoptosis) after 35 days exposure, 2-hr per day	Kesari, 2012
< 1.0 W/Kg	Rats exposed to mobile phone radiation on STANDBY ONLY for 11-hr 45-min plus 15-min TRANSMIT mode; 2 times per day for 21 days showed decreased number of ovarian follicles in pups born to these pregnant rats. The authors conclude "the decreased number of follicles in pups exposed to mobile phone microwaves suggest that intrauterine exposure has toxic effects on ovaries."	Gul, 2009
0.4 - 1.0 W/Kg	One 6-hr exposure to 1800 MHz cell phone radiation in human sperm cells caused a significant dose response and reduced sperm motility and viability; reactive oxygen species levels were significantly increased after exposure to 1.0 W/Kg; study confirms detrimental effects of RF/MW to human sperm. The authors conclude "(T)hese findings have clear implicatiions for the safety of extensive mobile phone use by males of reproductive age, potentially affecting both their fertility and the health and wellbeing of their offspring."	De Iuliis, 2009

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

SAR (Watts/Kilogram)		Reference
1.0 W/Kg	Human semen degraded by exposure to cell phone frequency RF increased free-radical damage.	De Iuliis, 2009
1.0 W/Kg	Motility, sperm count, sperm morphology, and viability reduced in active cell phone users (human males) in dose-dependent manner.	Agarwal, 2008
1.0 W/Kg	GSM cell phone use modulates brain wave oscillations and sleep EEG	Huber, 2002
1.0 W/Kg	Cell phone RFR during waking hours affects brain wave activity. (EEG patterns) during subsequent sleep	Achermann, 2000
1.0 W/Kg	Cell phone use causes nitric oxide (NO) nasal vasodilation (swelling inside nasal passage) on side of head phone use	Paredi, 2001
1.0 W/Kg	Four-fold increase in eye cancer (uveal melanoma) in cell phone users	Stang, 2001
1.0 W/Kg	Increase in headache, fatigue and heating behind ear in cell phone users	Sandstrom, 2001
1.0 W/Kg	Significant increase in concentration difficulties using 1800 MHz cell phone compared to 900 MHz cell phone	Santini, 2001
1.0 W/Kg	Sleep patterns and brain wave activity are changed with 900 MHz cell phone radiation exposure during sleep	Borbely, 1999
1.4 W/Kg	GSM cell phone exposure induced heat shock protein HSP 70 by 360% (stress response) and phosphorylation of ELK-1 by 390%	Weisbrot, 2003
1.46 W/Kg	850 MHz cell phone radiation decreases sperm motility, viability is significantly decreased; increased oxidative damage (free-radicals) significantly decreased; increased oxidative damage (free-radicals)	Agarwal, 2009
1.48 W/Kg	A significant decrease in protein kinase C activity at 112 MHz with 2-hr per day for 35 days; hippocampus is site, consistent with reports that RFR negatively affects learning and memory functions	Paulraj, 2004
1.0 - 2.0 W/Kg	Significant elevation in micronuclei in peripheral blood cells at 2450 MHz (8 treatments of 2-hr each)	Trosic, 2002
1.5 W/Kg	GSM cell phone exposure affected gene expression levels in tumor suppressor p53-deficient embryonic stem cells; and significantly increased HSP 70 heat shock protein production	Czyz, 2004

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

SAR (Watts/Kilogram)		Reference
1.8 W/Kg	Whole-body exposure to RF cell phone radiation of 900-1800 MHz 1 cm from head of rats caused high incidence of sperm cell death; deformation of sperm cells; prominent clumping together of sperm cells into "grass bundle shapes" that are unable to separate/swim. Sperm cells unable to swim and fertilize in normal manner.	Yan, 2007
2.0 W/Kg	GSM cell phone exposure of 1-hr activated heat shock protein HSP 27 (stress response) and P38 MAPK (mutagen-activated protein kinase) that authors say facilitates brain cancer and increased blood-brain barrier permeability, allowing toxins to cross BBB into brain	Leszczynski, 2002
2 W/Kg	900 MHz cell phone exposure caused brain cell oxidative damage by increasing levels of NO, MDA, XO and ADA in brain cells; caused statistically significant increase in 'dark neurons' or damaged brain cells in cortex, hippocampus and basal ganglia with a 1-hr exposure for 7 consecutive days	Ilhan, 2004
2.6 W/Kg	900 MHz cell phone exposure for 1-hr significantly altered protein expression levels in 38 proteins following irradiation; activates P38 MAP kinase stress signalling pathway and leads to changes in cell sie and shape (shrinking and rounding up) and to activation of HSP 27, a stress protein (heat shock protein)	Leszczynski, 2004
2.0 - 3.0 W/Kg	RFR accelerated development of both skin and breast tumors	Szmigielski, 1982
2 W/Kg	Pulse-modulated RFR and MF affect brain physiology (sleep study)	Schmidt, 2012

STANDARDS		
0.08 W/Kg	IEEE Standard uncontrolled public environment (whole body)	IEEE
0.4 W/Kg	IEEE Standard controlled occupational environment (whole body)	IEEE
1.6 W/Kg	FCC (IEEE) SAR limit for 1 gram of tissue in a partial body exposure	FCC, 1996
2 W/Kg	ICNIRP SAR limit for 10 grams of tissue	ICNIRP, 1996

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effeccts	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

DAVID CARPENTER
EXHIBIT B

Reference List
Reported Biological Effects from Radiofrequency Radiation (RFR) at Low-Intensity Exposure Levels

(Cell Tower, WI-FI, Wireless Laptop,
Wireless Utility Meters 'smart meters')

Prepared November 22, 2012 by:
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Acherman P et al, 2000. Exposure to pulsed high-frequency electromagnetic field during waking affects human sleep EEG. NeuroReport 11(15):3321-3325.

Adey,WR et al, 1999. Incidence of spontaneous and nitrosourea-induced primary tumors of the central nervous system in Fischer 344 rats chronically exposed to modulated microwaves. Radiation Research 152: 293-302.

Agarwal A, Deepinder F, Sharma RK, Ranga G, Li J.2008. Effect of cell phone usage on semen analysis in men attending infertility clinic: an observational study. Fertil Steril. 89(1): 124-8.

Agarwal A, Desai NR, Makker K, Varghese A, Mouradi R, Sabanegh E, Sharma R. 2009. Effects of radiofrequency electromagnetic waves (RF-EMW) from cellular phones on human ejaculated semen: an in vitro pilot study. Fertil Steril. 92(4) 1318-1325.

Aitken RJ, Bennetts LE, Sawyer D, Wiklendt AM, King BV. 2005 Impact of radio frequency electromagnetic radiation on DNA integrity in the male germline 28:171-179.

Akoev, IG et al, 2002. Enzymatic activity of some tissues and blood serum from animals and humans exposed to microwaves and hypothesis on the possible role of free radical processes in the nonlinear effects and modification of emotional behavior of animals. Radiats Biol Radioecol, 42(3):32-330.

Atasoy HI, Gunal MY, Atasoy P, Elgun S, Bugdayci G. 2012 Immunohistopathologic demonstration of deleterious effects on growing rat testes of radiofrequency waves emitted from conventional Wi-Fi devices. J Pediatr Urol. [Epub ahead of print]

Avendano C, Mata A, Sanchez Sarmiento CA, Doncei GF. 2012. Use of laptop computers connected to internet through Wi-Fi decreases human sperm motility and increases sperm DNA fragmentation. Fertility and Sterility. American Society for Reproductive Medicine, Published by Elsevier Inc. doi:10.1016/j.fertnstert.2011.10.012.

Beason, RC & Semm, P, 2002. Responses of neurons to an amplitude modulated microwave stumuls. Neuroscience Letters 333:175-178.

Behari J, Kesari KK 2006. Effects of microwave radiations on reproductive system of male rats. Embryo Talk 1 (Suppl.1):81-5.

Belokrinitsky, VS, 1982,. Destructive and reparative processes in hippocampus with long-term exposure to nonionizing radiation. In: U.S.S.R. Report, Effects of Nonionizing Microwave Radiation, No. 7, JPRS 81865, pp. 15-20.

Belyaev IY, Alipov YD, Harms-Ringdahl M. 1997. Effects of zero magnetic field on the conformation of chromatin in human cells. Biochim Biophys Acta 1336(3):465-473.

Belyaev IY, Hillert L, Protopopova M, Tamm C, Malmgren LO, Persson BR, Selivanova G, Harms-Ringdahl M. 2005. 915 MHz microwaves and 50 Hz magnetic field affect chromatin conformation and 53BP1 foci in human lymphocytes from hypersensitive and healthy persons. Bioelectromagnetics. 26(3):173-184.

Belyaev IY, Markova E, Hillert L, Malmgren LOG, Persson BRR. 2009. Microwaves from UMTS/GSM mobile phones induce long- lasting inhibition of 53BP1/γ-H2AX DNA repair foci in human lymphocytes. Bioelectromagnetics 30(2):129-41.

Bolshakov, MA & Alekseev, SI, 1992. Bursting responses of Lymnea neurons to microwave radiation. Bioelectromagnetics 13(2): 119-129.

Borbely, AA et al, 1999. Pulsed high-frequency electromagnetic field affects human sleep and sleep electroencephalogram. Neuroscience Letters 275(3): 207-210.

Boscolo et al, 2001. Effects of electromagnetic fields produced by radiotelevision broadcasting stations on the immune system of women. Sci Total Environ 273(1-3):1-10.

Buchner K, Eger H., 2011. Changes of Clinically Important Neurotransmitters under the Influence of Modulated RF Fields—A Long-term Study under Real-life ConditionsUmwelt-Medizin-Gesellschaft 24(1): 44-57. Original study in German.

Chia SE et al, 2000. Prevalence of headache among handheld cellular telephone users in Singapore: A Community Study. Environmental Health Perspectives 108(11):1059-1062.

Chiang, H et al, 1989. Health effects of environmental electromagnetic fields. Journal of Bioelectricity 8: 127-131.

Chou, CK et al, 1992. Long-term low level microwave irradiation of rats. Bioelectromagnetics 13:469-496.

Czyz J et al, 2004. High frequency electromagnetic fields (GSM signals) affect gene expression levels in tumor suppressor p53-deficient embryonic stem cells. Bioelectromagnetics 25: 296-307.

Dasdag, S et al, 1999. Whole-body microwave exposure emitted by cellular phones and testicular function of rats. Urological Research 27(3):219-223.

D'Costa, H et al. 2003. Human brain wave activity during exposure to radiofrequency field emissions from mobile phones. Australasian Physical & Engineering Sciences in Medicine, Vol. 26, No. 4

De Pomerai, D et al, 2000. Non-thermal heat-shock response to microwaves. Nature 405: 417-418.

D'Inzeo, G et al, 1988. Microwave effects on acetylcholine-induced channels in cultured chick myotubes. Bioelectromagnetics 9: 363-372.

De Iuliis GN, Newey RJ, King BV, Aitken RJ. 2009. Mobile phone radiation induces reactive oxygen species production and DNA
damage in human spermatozoa in vitro. PLoS One 4(7):e6446.

Dolk, H et al, 1997. Cancer incidence near radio and television transmitters in Great Britain. American Journal of Epidemiology 145(1): 1-9.

Dumansky, JD & Shandala, MG, 1974. The biological action and hygenic
significance of elecromagnetic fields of superhigh and ultrahigh frequencies in densely populated areas. In: Biological Effects and Health Hazards of Microwave Radiation. Proceedings of an International Symposium, Czerski, P et al, (Eds) Warsaw, 15-18 October 1973, Polish Medical Publishers.

Dutta, SK et al, 1989. Radiofrequency radiation-induced calcium ion efflux enhancement from human and other neuroblastoma cells in culture. Bioelectromagnetics 10: 197-202.

Elekes, E, 1996. Effect on the immune system of mice exposed chronically to 50 Hz amplitude-modulated 2.45 GHz microwaves. Bioelectromagnetics 17:246-248.

Eltiti S, Wallace D, Ridgewell A, Zougkou K, Russo R, Sepulveda F, Mirshekar-Syahkal D, Rasor P, Deeble R, Fox E. 2007. Does short-term exposure to mobile phone base station signals increase symptoms in individuals who report sensitivity to electromagnetic fields? A double-blind randomized provocation study. Environ Health Perspect 115(11): 1603-8.

Eltiti S, Wallace D, Ridgewell A, Zougkou K, Russo R, Sepulveda F, Fox E. 2009. Short-term exposure to mobile phone base station signals does not affect cognitive functioning or physiological measures in individuals who report sensitivity to electromagnetic fields and controls. Bioelectromagnetics 30(7):556-63.

DAVID CARPENTER
EXHIBIT B

Federal Communications Commission, 1997. OET Bulletin 65: 1997-01

Fesenko, EE et al, 1999. Microwaves and cellular immunity. I. Effect of whole body microwave irradiation on tumor necrosis factor production in mouse cells. Bioelectrochemistry and Bioenergetics 49 (1): 29-35.

Fragopoulou AF, Koussoulakos SL, Margaritis LH. 2010. Cranial and postcranial skeletal variations induced in mouse embryos by mobile phone radiation. Pathophysiology. 17(3): 169-77.

Garaj-Vrhrovac, V et al, 1999. Micronucleus assay and lymphocyte mitotic activity in risk assessment of occupational exposure to microwave radiation. Chemosphere 39 (13) 2301-2312.

Grundler W, Kaiser F, Keilmann F, Walleczek J. 1992. Mechanisms of electromagnetic interaction with cellular systems. Naturwissenschaften 79(12):551-9.

Gul A, Celebi H, Uğraş S.2009. The effects of microwave emitted by cellular phones on ovarian follicles in rats. Arch Gynecol Obstet. 280(5):729-33,

Hamblin, D. et al, 2004. Examining the effects of electromagnetic fields emitted by GSM mobile phones on human event-related potentials and performance during an auditory task. Clinical Neurophysiology 115:171-178.

Hamnerius, Y, 2000. Microwave exposure from mobile phones and base stations in Sweden. International Conference on Cell Tower Siting, June 7-8, 2000, Sponsored by the University of Vienna & LandSalzburg, Salzburg, Austria.

Heinrich S, Thomas S, Heumann C, von Kries R, Radon K. 2010. Association between exposure to radiofrequency electromagnetic fields assessed by dosimetry and acute symptoms in children and adolescents: a population based cross-sectional study. Environ Health 9:75.

Hjollund NH, Bonde JP, Skotte J, 1997 Semen analysis of personnel operating military radar equipment. Reprod Toxicol 11(6):897

Hocking, B et al, 1996. Cancer incidence and mortality and proximity to TV towers Medical Journal of Australia 165(11-12): 601-605.

Hocking, B et al, 2000. Decreased survival for childhood leukemia in proximity to TV towers. Poster presented at the Annual Scientific Meeeting of the Royal Australian College of Physicians in Adelaide, SA, Australia, May 2000.

Huber, R et al, 2002. Electromagnetic fields, such as those from mobile phonesm alter regional cerebral blood flow and sleep and waking EEG. J. Sleep Res. 11: 289-295.

Hutter HP, Moshammer H, Wallner P. Kundi M. 2006. Subjective symp- toms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations, Occup. Environ. Med. 63. 307–313.

IEEE, 1999. C95: 1-1999(US)

Ilhan A, Gurel A, Armutcu F, Kamisli S, Iraz M, Akyol O, Ozen S. 2004, Ginkgo biloba prevents mobile phone-induced oxidative stress in rat brain. Clin Chim Acta. 340(1-2): 153-162.

Ilhan, A et al. 2004. Ginkgo biloba prevents mobile phone-induced oxidative stress in rat brain. Clinica Chimica Acta 340, 153-162.

Ivaschuk, OI et al, 1997. Exposure of nerve growth factor-treated PC 12 rat pheochromocytoma cells to a modulated radiofrequency field at 836.55 MHz: effects on c-jun and c-fos expression. Bioelectromagnetics 18 (3): 223-229.

Kesari KK, Behari J. 2012 Evidence for mobile phone radiation exposure effects on reproductive pattern of male rats: Role of ROS. Electromagn Biol Med. 31(3):213-22,

Khurana VG, Hardell L, Everaert J, Bortkiewicz A, Carlberg M, Ahonen M. 2010. Epidemiological evidence for a health risk from mobile phone base stations. Int J Occup Environ Health. 16(3):263-267.

Koivisto, M et al, 2000a. Effects of 902 MHz electromagnetic field emitted by cellular telephones on response times in humans. Neuroreport 11: 413-415.

Koivisto, M et al, 2000b. The effects of electromagnetic field emitted by GSM phones on working memory. Neuroreport 11:1641-1643.

Kolodynski, AA, & Kolodynska VV, 1996. Motor and psychological functions of school children living in the area of the Skrunda radio location station in Latvia. Science of the Total Environment 180:87-93.

Krause, CM et al, 2000. Effects of electromagnetic field emitted by a cellular phone on the EEG during a memory task. Neuroreport 11:761-764.

Kues, HA et al, 1992. Increased sensitivity of the non-human primate eye to radiation following opthalmic drug pretreatment. Bioelectromagnetics 13:379-393.

Kumar S Behari J Sisodia R. 2012. Impact of Microwave at X-Band in the aetiology of male infertility. Electromagnetic Biology and Medicine, 31(3): 223–232. online DOI: 10.3109/15368378.2012.700293.

DAVID CARPENTER
EXHIBIT B

Kundi M. Hutter HP. 2009. Mobile phone base stations—Effects on wellbeing and health. Pathophysiology 16 123–135.

Kwee, S et al, 1997. The biological effects of microwave radiation. Proceedings of the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June 1997.

Kwee, S et al, 2001. Changes in cellular protiens due to environmental non-ionizing radiation. I. Heat-shock protiens. Electro-and Magnetobiology 20:141-152.

Lai H, & Singh, NP, 1996. Single and double strand DNA breaks in rat brain cells after acute exposure to radiofrequency electromagnetic radiation. International Journal of Radiation Biology 69:513-21.

Lass, J et al, 2002. Effects of 7 Hz-modulated 450 MHz electromagnetic radiation on human performance in visual memory tasks. Int. J. Radiat. Biol. 73(10): 937-944.

Lebedeva NN et al, 2000. Cellular phone electromagnetic field effects on bioelectric activity of human brain. Crit Rev Biomed Eng 28(1-2) 323-337.

Leszczynski, D et al, 2002. Non-thermal activation of the hsp27/p38MAPK stress pathway by mobile phone radiation in the human endothelial cells: Molecular mechanism for cancer- and blood-brain barrier-related effects. Differentiation 70: 120-129.

Leszczynski, D et al, 2004. Proteomics analysis of human endothelial cell line EA.hy926 after exposue to GSM 900 radiation. Short Communication. Proteomics 4, 1359-1365.

Lu, ST et al, 1999. Ultrawide-band electromagnetic pulses induced hypotension in rats. Physiology and Behavior, 67:753-761.

Magras, IN & Zenos, TD, 1997. RF Radiation-induced changes in the prenatal development of mice. Bioelectromagnetics 18:455-461.

Mann, K et al, 1996. Effects of pulsed high-frequency electromagnetic fields on human sleep. Neuropsychobiology 33:41-47.

Mann, K et al, 1998. Effects of pulsed high-frequency electromagnetic fields on the neuroendocrine system. Neuroendocrinology 67: 139-144.

Mantiply, ED et al, 1997. Summary of measured radiofrequency electric and magnetic fields (10 kHz to 30 GHz) in the general and work environment. Bioelectromagnetics 18: 563-577.

Markova E, Hillert L, Malmgren L, Persson BRR, Belyaev IY. 2005. Microwaves from GSM mobile telephones affect 53BP1 and y-H2AX foci in human lymphocytes from hypersensitive and healthy persons. Environmental Health Perspectives Vol 113: No. 91 1172-1177

DAVID CARPENTER
EXHIBIT B

Marinelli, F La Sala D Ciccciotti G Cattini L Trimarchi C Putti S Zamparelli A Giuilani L Tomassetti G Cinti C. 2004. Exposure to 900 MHz Electromagnetic Field induces an unbalance between pro-apoptotic and pro-survival signals in T-lymphoblastoid leukemia CCRF-CEM cells. Journal of Cellular Physiology 198: 324 – 332.

Mohler E, Frei P, Braun-Fahrländer C, Fröhlich J, Neubauer G, Röösli M; Qualifex Team. 2010. Effects of everyday radiofrequency electromagnetic-field exposure on sleep quality: a cross-sectional study. Radiat Res 174(3):347-56.

Oberfeld, G Enrique, NA Manuel P Ceferino M Gomez-Perrretta C. 2004. The Microwave Syndrome – Further Aspects of a Spanish Study. 3rd International Workshop on Biological Effects of Electromagnetic Fields. Kos, Greece.

Otitoloju AA, Obe IA, Adewale OA, Otubanjo OA, Osunkalu VO. 2010. Preliminary study on the induction of sperm head abnormalities in mice, Mus musculus, exposed to radiofrequency radiations from global system for mobile communication base stations. Bulletin of Environmental Contamination and Toxicology 84(1):51-4.

Navakatikian, MA & Tomashevskaya, LA, 1994 Phasic behavioral and endocrine effects of microwaves of nonthermal intensity. In: Biological Effects of Electric and Magnetic Fields, Volume 1, Carpenter, DO, (Ed.) Academic Press, Inc., San Diego, CA., pp. 333-342.

Navarro EA, Sequra J, Portoles M, Gomez-Perretta de Mateo C. 2003. The Microwave Syndrome: A Preliminary Study in Spain. Electromag Biol Med 22:161-169,

Novoselova, EG et al, 1999. Microwaves and cellular immunity. II Immunostimulating effects of microwaves and naturally occurring antioxident nutrients. Bioelectrochemistry and Bioenergetics 49 (1): 37-41.

Panagopoulos DJ. 2012. Effect of microwave exposure on the ovarian development of Drosophila melanogaster. Cell Biochem Biophys. 63(2):121-132,.

Paulraj R, Behari J. 2004. Radio frequency radiation effects on protein kinase C activity in rats' brain. Mutat Res. 545(1-2):127-130,

Persson, RR et al, 1997. Blood-brain barrier permeability in rats exposed to electromagnetic fields used in wireless communication. Wireless Networks 3:455-461.

Paredi P et al, 2001. Local Vasodilator Response to Mobile Phones. Laryngoscope 111: 159-162.

Phillips, J et al, 1998. DNA damage in molt-4 lymphoblastoid cells exposed to cellular telephone radiofrequency fields in vitro. Bioelectrochemistry and Bioenergetics 45:103-110.

Preece. A et al, 1999. Effect of a 915-MHz simulated mobile phone signal on cognitive function in man. International Journal of Radiation Biology 75: 447-456.

Pyrpasopoulou, A et al, 2004. Bone morphogenetic protein expression in newborn rat kidneys after prenatal exposure to radiofrequency radiation. Bioelectromagnetics 25: 216-227.

Ray, S & Behari, J, 1990. Physiological changes in rats after exposure to low levels of microwaves. Radiation Research 123: 190-202.

Repacholi, M. et al, 1997. Lymphomas in Eμ-Pim1 transgenic mice exposed to pulsed 900 MHz electromagnetic fields. Radiation Research 147:31-40.

Richter, E et al, 2000. Cancer in radar technicians exposed to radiofrequency/microwave radiation: sentinel episodes. International Journal of Occupational Health 6(3): 187-193.

Riddervold IS, Pedersen GF, Andersen NT, Pedersen AD, Andersen JB, Zachariae R, Mølhave L, Sigsgaard T, Kjaergaard SK. 2008. Cognitive function and symptoms in adults and adolescents in relation to RF radiation from UMTS base stations. Bioelectromagnetics 29(4):257-67.

Sage Associates, 2004. An Overview of Low-Intensity Radiofrequency/Microwave Radiation Studies Relevant to Wireless Communications and Data. Bioelectromagnetics Society Annual Meeting, Washington DC, June 2004.

Sage Associates, 2004. Epidemiology for Decisionmakers: A Visual Guide to Residential and Occupational EMF Epidemiological Results on Leukemia 1979-2004.
International Conference on Leukemia, London, September 2004. Children with Leukemia Trust (UK Registered Charity No. 298405).

Sage Associates, 2000. An overview of radiofrequency/microwave radiation studies relevant to wireless communications and data. International Conference on Cell Tower Siting, Salzburg, Austria, Land Salzburg-Landessanitatsdirektion – Umweltmedizin, Federal State of Salzburg Public Health Department, Environmental Health Unit, June 7-8, 2000.

Salama N, Kishimoto T, Kanayama HO. 2010. Effects of exposure to a mobile phone on testicular function and structure in adult rabbit. Int J Androl. 33(1):88-94.

Salford, LG et al. 1994. Permeability of the blood brain barrier induced by 915 MHz electromagnetic radiation, continuous wave and modulated at 8, 16, 50 and 200 Hz. Microscopy Research and Technique 27:535-542.

Salford, LG et al, 2003. Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones. Environmental Health Perspectives Online January 29.

Sandstrom M et al, 2001. Mobile phone use and subjective symptoms. Comparison of symptoms experienced by users of analogue and digital mobile phones. Occup Med 51(1) 25-35.

Santini R et al, 2001. Symptoms rapportes par des utilisateurs de telephones mobiles cellulaires. Path Biol 49:222-226.

Sarimov, R., Malmgren, L.O.G., Markova, E., Persson, B.R.R.. Belyaev, I.Y. 2004. Nonthermal GSM microwaves affect chromatin conformation in human lymphocytes similar to heat shock. IEEE Trans Plasma Sci 32:1600-1608,

Schirmacher, A et al, 2000. Electromagnetic fields (1.8 GHz) increase the permeability of sucrose of the blood-brain barrier in vitro. Bioelectromagnetics 21:338-345.

Schmidt M Murbach M Inelustenberger C Maire M Kuster N Achermann P. s2012. Sleep EEG alterations: effects of pulsed magnetic fields versus pulse-modulated radio frequency electromagnetic fields. J. Sleep Research, European Sleep Research Society DOI: 10.1111/ j.1365-2869.2012.01025.x.

Schwartz, JL et al, 1990. Exposure of frog hearts to CW or amplitude-modulated VHF fields: selective efflux of calcium ions at 16Hz. Bioelectromagnetics 11(4): 349-358.

Seaman, RL et al, 1999. Hyperactivity caused by nitric oxide synthase inhibitor is countered by ultra-wide band pulses. Bioelectromagnetics 20: 431-439.

Somosy, Z et al, 1991. Effects of modulated and continuous microwave irradiation on the morphology and cell surface negative charge of 3T3 fibroblasts. Scanning Microsc 5(4): 1145-1155.

Somosy, Z et al, 1993. Effects of modulated and continuous microwave irradiation on pyroantimonate precipitable calcium content in junctional complex of mouse small intestine. Scanning Microsc 7(4): 1255-1261.

Stagg RB et al, 1997. DNA synthesis and cell proliferation in C6 glioma and primary glial cells exposed to 836.55 MHz modulated radiofrequency field. Bioelectromagnetics 18(3):230-236.

Stang A et al, 2001. The possible role of radiofrequency radiation in the development of uveal melanoma. Epidemiology 12(1):7-12.

Stankiewicz W, Dąbrowski MP, Kubacki R, Sobiczewska E, Szmigielski S. 2006. Immunotropic Influence of 900 MHz Microwave GSM Signal on Human Blood Immune Cells Activated in Vitro. Electromagnetic Biology and Medicine 25(1) 45-51.

Stark KD et al, 1997. Absence of chronic effect of exposure to short-wave radio broadcast signal on salivary melatonin concentrations in dairy cattle. J Pineal Res 22(4):171:176.

Sun W, Shen X, Lu D, Fu Y, Chiang H. 2012. A 1.8-GHz radiofrequency radiation induces EGF receptor clustering and phosphorylation in cultured human amniotic (FL) cells. Int J Radiat Biol 88(3):239-44.

Szmigielski, S et al, 1982. Accelerated development of spontaneous and benzpyrene-induced skin cancer in mice exposed to 2350 MHz microwave radiation. Bioelectromagnetics 3: 179-192.

Tattersall, JE et al, 2001. Effects of low intensity radiofrequency electromagnetic fields on electrical activity in rat hippocampal slices. Brain Res 904(1): 43-53.

Thomas S, Kühnlein A, Heinrich S, Praml G, Nowak D, von Kries R, Radon K. 2008. Personal exposure to mobile phone frequencies and well-being in adults: a cross-sectional study based on dosimetry. Bioelectromagnetics 29:463-470.

Thomas S, Heinrich S, von Kries R, Radon K. 2010. Exposure to radio-frequency electromagnetic fields and behavioural problems in Bavarian children and adolescents. Eur J Epidemiol 25(2):135-41.

TNO Physics and Electronics Laboratory, The Netherlands. 2003. Effects of Global Communication System radio-frequency fields on well-being and cognitive functions of human beings with and without subjective complaints. Netherlands Organization for Applied Scientific Research 1-63.

Trosic, I et al, 2002. Micronucleus induction after whole-body microwave irradiation of rats. Mutation Research 521: 73-79.

Velizarov, S et al, 1999. The effects of radiofrequency fields on cell proliferation are non-thermal. Bioelectrochemistry and Bioenergetics 48: 177-180.

Veyret, B et al, 1991. Antibody responses of mice exposed to low-power microwaves under combined, pulse and amplitude modulation. Bioelectromagnetics 12: 47-56.

Weisbrot, D et al, 2003. Effects of mobile phone radiation on reproduction and development in Drosophila melanogastor. Journal of Cellular Biochemistry 89: 48-55.

Wolke, S et al, 1996. Calcium homeostasis of isolated heart muscle cells exposed to pulsed high-frequency electromagnetic fields. Bioelectromagnetics 17(2): 144-153.

Yan JG, Agresti M, Bruce T, Yan YH, Granlund A, Matloub HS. 2007. Effects of cellular phone emissions on sperm motility in rats. Fertility and Sterility 88(4):957-64.

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