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Parents For Safe Technology

Parents are raising this issue in their schools across the nation and schools across the world are replacing industrial strength routers with safe technology.

Some Examples of Research Showing that WiFi Frequencies are NOT SAFE

Paulraj R, Behari J. Single strand DNA breaks in rat brain cells exposed to microwave radiation. Mutat Res. 596:76-80, 2006. (G-C)
This investigation concerns with the effect of low intensity microwave (2.45 and 16.5GHz, SAR 1.0 and 2.01W/kg, respectively) radiation on developing rat brain. Wistar rats (35 days old, male, six rats in each group) were selected for this study. These animals were exposed for 35 days at the above mentioned frequencies separately in two different exposure systems. After the exposure period, the rats were sacrificed and the whole brain tissue was dissected and used for study of single strand DNA breaks by micro gel electrophoresis (comet assay). Single strand DNA breaks were measured as tail length of comet. Fifty cells from each slide and two slides per animal were observed. One-way ANOVA method was adopted for statistical analysis. This study shows that the chronic exposure to these radiations cause statistically significant ($p<0.001$) increase in DNA single strand breaks in brain cells of rat.

Kesari KK, Behari J, Kumar S. Mutagenic response of 2.45 GHz radiation exposure on rat brain. Int J Radiat Biol. 86(4):334-343, 2010.

The study concludes that the chronic exposure to these radiations may cause significant damage to brain, which may be an indication of possible tumour promotion (Behari and Paulraj 2007).
Purpose: To investigate the effect of 2.45 GHz microwave radiation on rat brain of male wistar strain. Material and methods: Male rats of wistar strain (35 days old with 130 +/- 10 g body weight) were selected for this study. Animals were divided into two groups: Sham exposed and experimental. Animals were exposed for 2 h a day for 35 days to 2.45 GHz frequency at 0.34 mW/cm(2) power density. The whole body specific absorption rate (SAR) was estimated to be 0.11 W/Kg. Exposure took place in a ventilated Plexiglas cage and kept in anechoic chamber in a far field configuration from the horn antenna. After the completion of exposure period, rats were sacrificed and the whole brain tissue was dissected and used for study of double strand DNA (Deoxyribonucleic acid) breaks by micro gel electrophoresis and the statistical analysis was carried out using comet assay (IV-2 version software). Thereafter, antioxidant enzymes and histone kinase estimation was also performed. Results: A significant increase was observed in comet head ($P < 0.002$), tail length ($P < 0.0002$) and in tail movement ($P < 0.0001$) in exposed brain cells. An analysis of antioxidant

enzymes glutathione peroxidase (P < 0.005), and superoxide dismutase (P < 0.006) showed a decrease while an increase in catalase (P < 0.006) was observed. A significant decrease (P < 0.023) in histone kinase was also recorded in the exposed group as compared to the control (sham-exposed) ones. One-way analysis of variance (ANOVA) method was adopted for statistical analysis. Conclusion: The study concludes that the chronic exposure to these radiations may cause significant damage to brain, which may be an indication of possible tumour promotion (Behari and Paulraj 2007).

Radicheva N, Mileva K, Georgieva B, Kristev I. Long-lasting (fatiguing) activity of isolated muscle fibres influenced by microwave electromagnetic field. Acta Physiol Pharmacol Bulg 26(1-2):37-40, 2001. (C-E)

The study aims to clarify the effect of exposure to microwave electromagnetic field (MMW) on muscle fibre fatigue. Repetitive stimulation with interstimulus interval of 200 ms was applied on isolated frog muscle fibre to evoke intracellular action potentials and twitch contractions. After their recording muscle fibre preparation was moved in a Petri dish with radius of 28 mm on open air for one hour exposure to continuous MMW with frequency of 2.45 GHz and power density of 20 mW/cm2. Then it was again moved in the chamber with non irradiated Ringer's solution at controlled temperature for the repeated records. After MMW exposure the changes in amplitude and time parameters characterizing fatigue were attenuated and delayed vs. controls. The twitch amplitude curve described an drastic fall in the first 5 sec followed by an increase and next decrease. MMW (2.45 GHz) have a specific, non-thermal influence on muscle fibre activity resulting in some resistance to fatigue.

Yang XS, He GL, Hao YT, Xiao Y, Chen CH, Zhang GB, Yu ZP. Exposure to 2.45 GHz electromagnetic fields elicits an HSP-related stress response in rat hippocampus. Brain Res Bull. 2012 Jul 1;88(4):371-378, 2012.

The issue of possible neurobiological effects of the electromagnetic field (EMF) exposure is highly controversial. To determine whether electromagnetic field exposure could act as an environmental stimulus capable of producing stress responses, we employed the hippocampus, a sensitive target of electromagnetic radiation, to assess the changes in its stress-related gene and protein expression after EMF exposure. Adult male Sprague-Dawley rats with body restrained were exposed to a 2.45 GHz EMF at a specific absorption rate (SAR) of 6 W/kg or sham conditions. cDNA microarray was performed to examine the changes of gene expression involved in the biological effects of electromagnetic radiation. Of 2048 candidate genes, 23 upregulated and 18 downregulated genes were identified. Of these differential expression genes, two heat shock proteins (HSP), HSP27 and HSP70, are notable because expression levels of both proteins are increased in the rat hippocampus. Result from immunocytochemistry revealed that EMF caused intensive staining for HSP27 and HSP70 in the hippocampus, especially in the pyramidal neurons of cornu ammonis 3 (CA3) and granular cells of dentate gyrus (DG). The gene and protein expression profiles of HSP27 and HSP70 were further confirmed by reverse transcription polymerase chain reaction (RT-PCR) and Western blot. Our data provide direct evidence that exposure to electromagnetic fields elicits a stress response in the rat hippocampus.The hippocampus in the brain is the seat of learning and memory formation and consolidation.

Elekes, E, Thuroczy, G, Szabo, LD, Effect on the immune system of mice exposed chronically to 50 Hz amplitude-modulated 2.45 GHz microwaves. Bioelectromagnetics 17(3):246-248, 1996. (I-M, N-T)

The effect of continuous (CW; 2.45 GHz carrier frequency) or amplitude-modulated (AM; 50 Hz square wave) microwave radiation on the immune response was tested. CW exposures (6 days, 3 h/day) induced elevations of the number of antibody-producing cells in the spleen of male Balb/c mice (+37%). AM microwave exposure induced elevation of the spleen index (+15%) and antibody-producing cell number (+55%) in the spleen of male mice. No changes were observed in female mice. It is concluded that both types of exposure conditions induced moderate elevation of antibody production only in male mice.

Aweda MA, Gbenebitse S, Meidinyo RO. Effects of 2.45 GHz microwave exposures on the peroxidation status in Wistar rats. Niger Postgrad Med J. 10(4):243-6, 2003.

One of the consequences of exposures to microwave (MW) radiations is the enhanced production of free O2, free radicals, peroxides and superoxides. The effects on the lipid peroxidation status (LPS) of whole body irradiation of 120 Wistar rats with 2.45 GHz MW at a power density of 6mWcm(-2) have been studied using the MW generator model ER6660E from Toshiba UK Ltd. The LPS in the rats was monitored for a period of 8 weeks post irradiation using thiobarbituric acid (TRA) method. The MW exposures caused an increase in the LPS from the mean control value of 4.18 x 10(-6)g 1(-1)to a maximum of 6.50 x 10(-6) g 1(-1) within the first 24 hrs, and then gradually reduced to control value after about a week. 1mg kg(-1) of ascorbic acid administered before irradiation caused a decrease in the LPS from the control value to a minimum of 2.86 x 10(-6)g 1(-1) within the first week. The value then gradually rose to a maximum of 3.96 x 10(-6)g 1(-1) within the monitoring period. 1 mg kg(-1) of a-tocopherol also administered before irradiation also caused a decrease in the LPS from the control value to a minimum of 2.10 x 10(-6) g 1(-1) within the first week. The value then gradually rose to a maximum of 3.94 x 10(-6) g 1(-1) within the monitoring period. The results obtained from this study demonstrate that MW exposures cause significant increase in the LPS and there are protective effects of the anti-oxidants ascorbic acid and alpha-tocopherol.

Busljeta I, Trosic I, Milkovic-Kraus S. Erythropoietic changes in rats after 2.45 GJz nonthermal irradiation. Int J Hyg Environ Health. 207(6):549-554, 2004. (C-E, G-C)

The purpose of this study was to observe the erythropoietic changes in rats subchronically exposed to radiofrequency microwave (RF/MW) irradiation at nonthermal level. Adult male Wistar rats (N=40) were exposed to 2.45 GHz continuous RF/MW fields for 2 hours daily, 7 days a week, at 5-10 mW/cm2. Exposed animals were divided into four subgroups (n=10 animals in each subgroup) in order to be irradiated for 2, 8, 15 and 30 days. Animals were sacrified on the final irradiation day of each treated subgroup. Unexposed rats were used as control (N=24). Six animals were included into the each control subgroup. Bone marrow smears were examined to determine absolute counts of anuclear cells and erythropoietic precursor cells. The absolute erythrocyte count, haemoglobin and haematocrit values were observed in the peripheral blood by an automatic cell counter. The bone marrow cytogenetic analysis was accomplished by micronucleus (MN) tests. In the exposed animals erythrocyte count, haemoglobin and haematocrit were increased in peripheral blood on irradiation days 8 and 15. Concurrently, anuclear cells and erythropoietic precursor cells were significantly decreased ($p < 0.05$) in the bone marrow on day 15, but micronucleated cells' frequency was increased. In the applied experimental condition, RF/MW radiation might cause disturbance in red cell maturation and proliferation, and induce micronucleus formation in erythropoietic cells.

Cleary SF, Liu LM, Merchant RE, In vitro lymphocyte proliferation induced by radio-frequency electromagnetic radiation under isothermal conditions. Bioelectromagnetics 11(1):47-56, 1990.

Whole human blood was exposed or sham-exposed in vitro for 2 h to 27 or 2,450 MHz radio-frequency electromagnetic (RF) radiation under isothermal conditions (i.e., 37 +/- 0.2 degrees C). Immediately after exposure, mononuclear cells were separated from blood by Ficoll density-gradient centrifugation and cultured for 3 days at 37 degrees C with or without mitogenic stimulation by phytohemagglutinin (PHA). Lymphocyte proliferation was assayed at the end of the culture period by 6 h of pulse labeling with 3H-thymidine (3H-TdR). Exposure to radiation at either frequency at specific absorption rates (SARs) below 50 W/kg resulted in a dose-dependent, statistically significant increase of 3H-TdR uptake in PHA-activated or unstimulated lymphocytes. Exposure at 50 W/kg or higher suppressed 3H-TdR uptake relative to that of sham-exposed cells. There were no detectable

effects of RF radiation on lymphocyte morphology or viability. Notwithstanding the characteristic temperature dependence of lymphocyte activation in vitro,the isothermal exposure conditions of this study warrant the conclusion that the biphasic, dose-dependent effects of the radiation on lymphocyte proliferation were not dependent on heating.

Field AS, Ginsburg K, Lin JC The effect of pulsed microwaves on passive electrical properties and interspike intervals of snail neurons.Bioelectromagnetics 14(6):503-520, 1993.

The effects of pulsed microwaves (2.45 GHz, 10 microseconds, 100 pps, SAR: 81.5 kW/kg peak, 81.5 W/kg average) on membrane input resistance and action potential (AP) interval statistics were studied in spontaneously active ganglion neurons of land snails (Helix aspersa), at strictly constant temperature (20.8 +/- .07 degrees C worst case). Statistical comparison with sham-irradiated neurons revealed a significant increase in the mean input resistance of neurons exposed to pulsed microwaves (P < or = .05). Pulsed microwaves had no visible effect on mean AP firing rate; this observation was confirmed by analysis of interspike intervals (ISIs). Using an integrator model for spontaneously active neurons, we found the net input current to be more variable in neurons exposed to pulsed microwaves. The mean input current was not affected. The standard deviation of ISIs and the autocorrelation of the input current were marginally affected, but these changes were not consistent across neurons. Although the observed effects were less obvious than those reported in other studies, they represent evidence of a direct interaction between neurons and pulsed microwaves, in the absence of macroscopic temperature changes. The data do not suggest a single, specific mechanism for such interaction.
"they represent evidence of a direct interaction between neurons and pulsed microwaves, in the absence of macroscopic temperature changes"

Paul Raj, R, Behari, J. Rao, AR, Effects of low level 2.45 GHz microwave radiation on Ca2+ efflux and ODC activity in chronically exposed developing rat brain. Presented at the 'National Seminar on Low-level Electromagnetic Field Phenomena in Biological Systems'. New Delhi, India, February, 1999.

Developing rats were exposed to 2.45 GHz microwaves (2 hrs per day for 35 days at 0.334 mW/cm2). A 1.5 fold increase in brain ODC was observed in the exposed group compared to control. An increase in calcium efflux was also observed in forebrain tissue after chronic microwave exposure.
Paulraj R, Behari J. The effect of low level continuous 2.45 GHz waves on enzymes of developing rat brain.Electromag Biol Med 21:221-231, 2002. (R-D, M-E)
The present work describes the effect of low level continuous microwaves (2.45 GHz) on developing rat brain. Some 35-day-old Wistar rats were used for this study. The animals were exposed 2 hr/day for 35 days at a power density of 0.34 mW/cm2 [specific absorption rate (SAR), 0.1 W/kg] in a specially made anechoic chamber. After the exposure, the rats were sacrificed and the brain tissue was dissected out and used for various biochemical assays. A significant increase in calcium ion efflux and ornithine decarboxylase (ODC) activity was observed in the exposed group as compared to the control. Correspondingly, a significant decrease in the calcium-dependent protein kinase activity was observed. These results indicate that this type of radiation affects the membrane bound enzymes, which are associated with cell proliferation and differentiation, thereby pointing out its possible role as a tumor promoter.

Paulraj R, Behari J. Protein Kinase C Activity in developing rat brain cells exposed to 2.45 GHz radiation. Electromag Biol Med 25(1) 61-70, 2006.

There is growing concern by the public regarding the potential human health hazard due to exposure to microwave frequencies. 2.45 GHz radiation widespread use in industry, research, and medicine, and leakage into the environment is possible. In order to quantitate this, experiments were performed on developing rat brain. Male Wistar 35-day-old rats (n = 6) were used for this study. Animals were exposed to 2.45 GHz radiation for 2 h/day for a period of 35 days at a power density of 0.344 mW/cm2 (SAR 0.11 W/kg). The control group was sham irradiated. After 35 days these rats were sacrificed and whole brain tissue was isolated for protein kinase C (PKC) assay. For morphological study the forebrain was isolated from the whole brain and PKC activity was measured using P32 labeled ATP. Our study reveals a statistically significant ($p < 0.05$) decrease in PKC activity in hippocampus as compared to the remaining portion of the whole brain and the control group. A similar experiment conducted on hippocampus and the whole brain gave a similar result. Electron microscopic study shows an increase in the glial cell population in the exposed group as compared to the control group. This present study is indicative of a significant change after exposure to the above-mentioned field intensity. This suggests that chronic exposures may affect brain growth and development.

Peinn**equin A, Piriou A, Mathieu J, Dabouis V, Sebbah C, Malabiau R, Debouzy JC Non-thermal effects of continuous 2.45 GHz microwaves on Fas-induced apoptosis in human Jurkat T-cell line. Bioelectrochemistry51(2):157-161, 2000.**

Non-thermal effects of microwaves (MWs) are one of the main issues studied for revising standards. The effects of MW exposure on apoptosis at non-thermal level (48 h, 2.45 GHz, 5 mW/cm2) have been studied. Results obtained assess non-thermal MW effects on Fas, but neither on butyrate- nor on ceramide-induced apoptosis in human Jurkat T-cell line. These data show that MW interacts either with Fas pathway between receptor and caspase-3 activation or on membrane proteins (i.e. Fas receptor or neurosphyngomyelinase).

Saal**man E, Norden B, Arvidsson L, Hamnerius Y, Hojevik P, Connell KE, Kurucsev T, Effect of 2.45 GHz microwave radiation on permeability of unilamellar liposomes to 5(6)-carboxyfluorescein. Evidence of non-thermal leakage. Biochim Biophys Acta 1064(1):124-130, 1991.**

Sarkar S, Ali S, Behari J, Effect of low power microwave on the mouse genome: a direct DNA analysis. Mutat Res320(1-2):141-147, 1994. (C-H, G-C, M-E)Sarkar S, Ali S, Behari J, Effect of low power microwave on the mouse genome: a direct DNA analysis. Mutat Res 320(1-2):141-147, 1994. (C-H, G-C, M-E)
Thembrane was observed for the microwave-exposed samples compared to those exposed to normal heating only. 2.45 GHz microwave radiation of liposomes has been previously found to produce increased membrane permeability as compared with heating. However, in contrast to previous studies, the observations reported here were made above the phase transition temperature of the lipid membrane. The experimental setup included monitoring of the temperature during microwave exposure simultaneously at several points in the solution volume using a fiberoptic the

Sarkar S, Ali S, Behari J, Effect of low power microwave on the mouse genome: a direct DNA analysis. Mutat Res320(1-2):141-147, 1994. (C-H, G-C, M-E)Singh N, Rudra N, Bansal P, Mathur R, Behari J, Nayar U, Poly AG
The potential mutagenic effect of low power microwave at the DNA sequence level in the mouse

genome was evaluated by direct DNA analysis. Animals were exposed to microwave at a power density of 1 mW/cm2 for 2 h/day at a frequency of 2.45 GHz over a period of 120, 150 and 200 days. HinfI digested DNA samples from testis and brain of control and exposed animals were hybridized with a synthetic oligo probe (OAT 36) comprising nine repeats of 5'-GACA-3'. As compared to control animals, band patterns in exposed animals were found to be distinctly altered in the range of 7-8 kb which was also substantiated by densitometric analysis. Though the mechanism of this rearrangement is not yet clear, the results obtained at the present dose are of significance. This dose, which has been set as the safe limit for general public exposure by the Non-Ionizing Radiation Committee of the International Radiation Protection Association, may imply a need for (re)evaluation of the mutagenic potential of microwaves at the prescribed safe limit for the personnel and people who are being exposed.

Testylier G , Tonduli L, Malabiau R, Debouzy JC. Effects of exposure to low level radiofrequency fields on acetylcholine release in hippocampus of freely moving rats. Bioelectromagnetics 23:249-255, 2002.

Some central cholinergic effects have been reported in animals after acute exposure to radiofrequency electromagnetic field at low intensity. We studied acetylcholine (ACh) release in the brain of freely moving rats exposed for 1 h during the day to a 2.45 GHz continuous wave radiofrequency field (RF) (2 or 4 mW/cm2) or exposed for 1 or 14 h during the night to a 800 MHz field modulated at 32 Hz (AM 200 mW/cm2). Measurements were performed by microdialysis using a membrane implanted through the upper CA1 region of the hippocampus. After irradiation with the 2.45 GHz RF, rats exposed at 2 mW/cm2 did not show a significant modification of Ach release, whereas those exposed at 4 mW/cm2 showed a significant 40% decrease in mean ACh release from hippocampus. This decrease was maximal at 5 h post exposure. Exposure to the 800 MHz RF for 1 h did not cause any significant effect, but exposure for 14 hrs induced a significant 43% decrease in ACh release during the period 11 p.m.-4 a.m. compared to control rats. In the control group we observed an increase of ACh release at the beginning of the night, which was linked to the waking period of rats. This normal increase was disturbed in rats exposed overnight to the 800 MHz RF.This work indicates that neurochemical modification of the hippocampal cholinergic system can be observed during and after an exposure to low intensity RF.

Thuroczy G, Kubinyi G, Bodo M, Bakos J, Szabo LD, Simultaneous response of brain electrical activity (EEG) and cerebral circulation (REG) to microwave exposure in rats. Rev Environ Health 10(2):135-148, 1994.

The correlations between physiological modalities in microwave field-activated systemic or localized regulatory mechanisms with changes in the central nervous system (CNS) seem not to be identical. These problems are important because of the increased number of radiating appliances, e.g. portable radios and mobile telephones. In two series of experiments on anaesthetized rats (N = 40) (i) before and after 10 min, whole body exposures to 2.45 GHz CW microwaves, and (ii) during 30 min exposures to 4 GHz amplitude modulated (AM, 16 Hz) microwaves, the effects on the CNS were observed simultaneously with those on the cardiovascular system by quantitative polygraphic measurement. In acute experiments on rats, electroencephalograms (EEG), rheoencephalograms (REG) as an index of cerebral blood flow (CBF), brain tissue DC impedance and temperature and ECG were recorded simultaneously. The total power of EEG spectra increased after whole body 30 mW/cm2 2.45 GHz CW exposure for 10 min. No changes occurred at 10 mW/cm2. The CBF increased after 10 mW/cm2 exposure. The power of EEG delta (0.5-4 Hz) waves was increased by thermal level of brain localized 4 GHz CW exposure at 42 mW/g specific absorption rate (SAR) simultaneously with the REG amplitude as an index of cerebral blood flow. Amplitude modulation at 16 Hz and 8.4 mW/g SAR was associated with increased power of EEG beta (14.5-30 Hz) waves

but changes in the CBF were not observed. CW radiation at 8.4 mW/g increased the cerebral blood flow, but did not change EEG spectra.

Trosic I, Busljeta I, Pavicic I. Blood-forming system in rats after whole-body microwave exposure; reference to the lymphocytes. Toxicol Lett. 154(1-2):125-132, 2004.

The influence of 2.45GHz microwave (RF/MW) irradiation on blood-forming cells after whole-body irradiation of rats was investigated. The exposures were conducted with a field power density of 5-10mW/cm(2), and whole-body average specific absorption rate (SAR) of 1-2W/kg. Four experimental subgroups were created and irradiated 2, 8, 15 or 30 days, for 2h a day, 7 days a week. Concurrent sham-exposed rats were also included in the study. The cell response was assessed by number and type of the bone marrow nuclear cells and peripheral blood white cells using standard laboratory methods. Significant decrease in lymphoblast count was obtained at 15 and 30th experimental day ($P < 0.05$), whereas other examined parameters did not significantly differed in comparison to the sham-exposed controls. The findings point out at stress response in blood-forming system in rats after selected microwave exposure, which could be considered rather as sign of adaptation than malfunction.

Trosic I, Busljeta I, Modlic B. Investigation of the genotoxic effect of microwave irradiation in rat bone marrow cells: in vivo exposure. Mutagenesis. 19(5):361-364, 2004.

An in vivo mammalian cytogenetic test (the erythrocyte micronucleus assay) was used to investigate the extent of genetic damage in bone marrow red cells of rats exposed to radiofrequency/microwave (RF/MW) radiation. Wistar rats (n = 40) were exposed to a 2.45 GHz continuous RF/MW field for 2 h daily, 7 days a week, at a power density of 5-10 mW/cm(2). The whole body average specific absorption rate (SARs) was calculated to be 1.25 +/- 0.36 (SE) W/kg. Four subgroups were irradiated for 4, 16, 30 and 60 h. Sham-exposed controls (n = 24) were included in the study. The animals of each treated subgroup were killed on the final day of irradiation. Bone marrow smears were examined to determine the extent of genotoxicity after particular treatment times. The results were statistically evaluated using non-parametric Mann-Whitney and Kruskal-Wallis tests. In comparison with the sham-exposed subgroups, the findings of polychromatic erythrocytes (PCE) revealed significant differences ($P < 0.05$) for experimental days 8 and 15.The frequency of micronucleated PCEs was also significantly increased on experimental day 15 ($P < 0.05$). Pair-wise comparison of data obtained after 2, 8 and 30 irradiation treatments did not reveal statistically significant differences between sham-exposed and treated subgroups. Under the applied experimental conditions the findings revealed a transient effect on proliferation and maturation of erythropoietc cells in the rat bone marrow and the sporadic appearance of micronucleated immature bone marrow red cells.

Trosic I, Busljeta I. Frequency of micronucleated erythrocytes in rat bone marrow exposure to 2.45 GHz radiation. Physica Scripta T118: 168-170, 2005.

Wistar rats were exposed to 2.45GHz continuous, radiofrequency microwave (RF/MW) field 2 hours daily, 7 days weekly, at power density 5–10mW/cm2. Four subgroups were created in order to be irradiated 4, 16, 30 and 60 hours. Sham exposed controls were included in the study. Animals were euthanized on the final irradiation day of each treated subgroup. Bone marrow smears were examined to determine the extent of genotoxicity after the particular treatment time. Mann- Whitney testwas used for statistical evaluation of data. In comparison to the sham exposed subgroups, the findings of polychromatic erythrocytes revealed significant differences for the 8th and 15th experimental day. Bone marrow erythrocyte maturation and/or proliferation initiated by subthermogenic RF/MW irradiation showed temporary disturbance. Thereafter, the frequency of

micronucleated bone marrow red cells was significantly increased after 15 irradiation treatments. Comparison of micronucleus frequency data obtained after 2, 8 and 30 irradiation treatments did not reveal statistically significant differences between sham and treated subgroups. Under the applied experimental conditions, RF/MWirradiation initiates transitory cytogenetic effect manifested with micronucleus formation in erythropoietic cells.

Trosic I, Busljeta I. Erythropoietic dynamic equilibrium in rats maintained after microwave irradiation. Exp Toxicol Pathol. 57(3):247-251, 2006.

The aim of study was to define influence of radiofrequency microwave (RF/MW) radiation on erythropoiesis in rats. The kinetics of polychromatic erythrocytes (PCEs) and micronucleated (MN) PCEs in the bone marrow (BM) and peripheral blood (PB) of rats during the intermittent subchronic experiment was followed. Rats were exposed 2h/day, 7 days/week to RF/MW of 2.45GHz and whole-body specific absorption rate (SAR) of 1.25+/-0.36W/kg. Control animals were included in the study. Each exposed and control group was killed on the final day of irradiation. Acridine-orange stained BM and blood smears were examined by fluorescence microscope. PCEs were obtained by inspection of 2000BM and 1000PB erythrocytes/slides. BMMNs and PBMNs frequency was obtained by observation of 1000PCEs/slides. BMPCEs were increased on day 8 and 15, and PBPCEs were elevated on days 2 and 8 ($p<0.05$). The BMMN frequency was increased on experimental day 15, and MNPCEs in the PB was increased on day 8 ($p<0.05$). Findings of BM and PBPCEs or MNPCEs declined nearly to the control values until the end of the experiment. Such findings are considered to be indicators of radiation effects on BM erythropoiesis consequently reflected in the PB. Rehabilitated dynamic haemopoietc equilibrium in rats by the end of experiment indicates possibility of activation adaptation process in rats to the selected experimental conditions of subchronic RF/MW exposure. This study shows negative effects on red blood cells.... micronucleation means damaged DNA and damaged bone marrow with whole-body exposure for only two hours per day, each day. How many hours a day do children spend in classrooms, and doing homework?

Zotti-Martelli L, Peccatori M, Scarpato R, Migliore L, Induction of micronuclei in human lymphocytes exposed in vitro to microwave radiation. Mutat Res 472(1-2):51-58, 2000.

Increasing applications of electromagnetic fields are of great concern with regard to public health. Several in vitro studies have been conducted to detect effects of microwave exposure on the genetic material leading to negative or questionable results. The micronucleus (MN) assay which is proved to be a useful tool for the detection of radiation exposure-induced cytogenetic damage was used in the present study to investigate the genotoxic effect of microwaves in human peripheral blood lymphocytes in vitro exposed in G(0) to electromagnetic fields with different frequencies (2.45 and 7.7GHz) and power density (10, 20 and 30mW/cm(2)) for three times (15, 30 and 60min). The results showed for both radiation frequencies an induction of micronuclei as compared to the control cultures at a power density of 30mW/cm(2) and after an exposure of 30 and 60min. Our study would indicate that microwaves are able to cause cytogenetic damage in human lymphocytes mainly for both high power density and long exposure time.

n addition to the already established role of LMW in heat supplementation. This activation could be due to either increased core body temperature or initiation of intracellular signaling by the LMW radiation. This study also shows that the HMW radiation is capable of inducing pathology in the form of changes in the pulmonary interstitial matrix and may not be a good source of supplementary heat. Electromagnetic fields (EMFs) affect the metabolism of the body including the nervous, endocrine, cardiovascular, hematological as well as the reproductive system. EMFs are environmental pollutants, thus posing a health hazard which can cause steric changes in the molecule located at the cell surface. Microwaves are known to cause chromosomal abberations and act as tumor promoters. The process involves a stream of signals from cell membrane to nucleus and other organelles. The present investigations aim to understand the mechanism of biological effects of microwaves (2.45 GHz). The effect was studied on poly ADP-ribosylation, which is a post

translational modification of chromatin protein catalysed by the enzyme poly ADPR polymerase using NAD+ as the substrate. Poly ADP-ribosylation has been shown to be involved in several aspects of chromatin structure and function. Twenty-three days old rats weighing 42-48 gms were exposed at a microwave dose level of 1.0 mW/cm2. After exposure for sixty days the animals were sacrificed and an estimation of poly ADPR polymerase activity was undertaken in different organs of these animals. There was an increase of 20% in its activity in liver, 35% in testis, whereas brain showed a 53% decrease in diencephalon and 20% decrease in the cortex in the exposed animals as compared to their respective controls. There was no change in enzyme activity in spleen and kidney. This was accompanied by concomitant changes in NAD+ levels. The above results may be cited as important events in carcinogenesis and tumor promotion related to microwave exposure and the signal transduction mechanism involved. The goal is to shed light on complex ecogenetic interactions leading to cancer modulation of gene expression by epigenetic mechanism.

Electromagnetic fields (EMFs) affect the metabolism of the body including the nervous, endocrine, cardiovascular, hematological as well as the reproductive system. EMFs are environmental pollutants, thus posing a health hazard which can cause steric changes in the molecule located at the cell surface. Microwaves are known to cause chromosomal abberations and act as tumor promoters. The process involves a stream of signals from cell membrane to nucleus and other organelles. The present investigations aim to understand the mechanism of biological effects of microwaves (2.45 GHz). The effect was studied on poly ADP-ribosylation, which is a post translational modification of chromatin protein catalysed by the enzyme poly ADPR polymerase using NAD+ as the substrate. Poly ADP-ribosylation has been shown to be involved in several aspects of chromatin structure and function. Twenty-three days old rats weighing 42-48 gms were exposed at a microwave dose level of 1.0 mW/cm2. After exposure for sixty days the animals were sacrificed and an estimation of poly ADPR polymerase activity was undertaken in different organs of these animals. There was an increase of 20% in its activity in liver, 35% in testis, whereas brain showed a 53% decrease in diencephalon and 20% decrease in the cortex in the exposed animals as compared to their respective controls. There was no change in enzyme activity in spleen and kidney. This was accompanied by concomitant changes in NAD+ levels. The above results may be cited as important events in carcinogenesis and tumor promotion related to microwave exposure and the signal transduction mechanism involved. The goal is to shed light on complex ecogenetic interactions leading to cancer modulation of gene expression by epigenetic mechanism.
potential mutagenic effect of low power microwave at the DNA sequence level in the mouse genome was evaluated by direct DNA analysis. Animals were exposed to microwave at a power density of 1 mW/cm2 for

2 h/day at a frequency of 2.45 GHz over a period of 120, 150 and 200 days. HinfI digested DNA samples from testis and brain of control and exposed animals were hybridized with a synthetic oligo probe (OAT 36) comprising nine repeats of 5'-GACA-3'. As compared to control animals, band patterns in exposed animals were found to be distinctly altered in the range of 7-8 kb which was also substantiated by densitometric analysis. Though the mechanism of this rearrangement is not yet clear, the results obtained at the present dose are of significance. This dose, which has been set as the safe limit for general public exposure by the Non-Ionizing Radiation Committee of the International Radiation Protection Association, may imply a need for (re)evaluation of the mutagenic potential of microwaves at the prescribed safe limit for the personnel and people who are being exposed.
The potential mutagenic effect of low power microwave at the DNA sequence level in the mouse genome was evaluated by direct DNA analysis. Animals were exposed to microwave at a power density of 1 mW/cm2 for 2 h/day at a frequency of 2.45 GHz over a period of 120, 150 and 200 days. HinfI digested DNA samples from testis and brain of control and exposed animals were hybridized with a synthetic oligo probe (OAT 36) comprising nine repeats of 5'-GACA-3'. As compared to control animals, band patterns in exposed animals were found to be distinctly altered in the range of 7-8 kb which was also substantiated by densitometric analysis. Though the mechanism of this

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mometer. Possible mechanisms to explain the observations are discussed.

Let's Do This!

"Microwave from wireless tech disrupts thinking – what could be worse for learning? Technology can be used more safely with wired devices that do not produce these biologically-disruptive levels of microwave radiation"

-Cindy Sage, Co-Editor of the BioInitiative Report

Schools should be healthy learning environments. Wireless systems are being quickly rolled out despite the fact that they expose children and staff to six hours a day of unsafe radiation.

Safe Technology in Schools

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