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Research Article

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Multi-Layer-Hollow-Conductor-Systems (MLHCS) and their Ability to Compensate Artificial Environmental Impacts Affecting Cultured Human Neuronal Cells

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Abstract

Background: The use of electrical and telecommunication devices has led to a manmade, synthetic propagation of alternating fields for more than 100 years. The effects of electromagnetic fields have also been associated with neurodegenerative diseases or neurological disorders due to oxidative stress.

Experimental: We used a clonal subline of a neuroepithelioma cell line (SH-SY5Y) as a model for neuronal cells to study the effect of environmental background radiation with its low fare-field alternating field source with a field intensity in the range of nanowatt to microwatt present in common households and its compensation by two Multi-Layer-Hollow-Conductor-Systems (MLHCS and PP-MLHCS). The study was conducted with two independent experiments with 12 replicates for each individual experiment.

Results: Exposure of neuronal cells to background radiation with the use of the MLHCS showed an improvement in cell vitality by 17.7 ± 2.9 % and of basal cell metabolism by 15.9 ± 5.8 % compared to untreated control cells (mean values ± standard deviations). The values for MLHCS-treated cells differed significantly from the untreated controls ($p \leq 0.01$; Wilcoxon-Mann-Whitney test). The use of PP-MLHCS resulted in an improvement by 7.7 ± 2.8 % for cell vitality and 10.9 ± 3.7 % for basal cell metabolism compared to untreated control cells (mean values ± standard deviations). These values also differed significantly from the untreated controls ($p \leq 0.05$; Wilcoxon-Mann-Whitney test). In order to see whether the combination of both devices might act synergistically by increasing both measurement parameters to a maximum value, MLHCS and PP-MLHCS were used at the same time in comparison to untreated control cells. However, the improvement was 13.1 ± 6.3 % for cell vitality and 18.2 ± 8.4 % for basal metabolism (mean values ± standard deviations). The values differed significantly from the untreated controls ($p \leq 0.01$; Wilcoxon-Mann-Whitney test), but were not statistically different from the values for the single use of MLHCS and PP-MLHCS, respectively.

Conclusions: The use of the two Multi-Layer-Hollow-Conductor-Systems (MLHCS and PP-MLHCS), either alone or in combination, was able to partially compensate the environmental background radiation and subsequently to promote neuronal health. Thus, the devices can be recommended for humans and animals with a sensitivity against electromagnetic fields or as an intervention to avoid a permanent situation of oxidative stress coming from environmental sources. Both devices might be effective for maintaining and improving systemic health and individual well-being.

Keywords: Electromagnetic Fields, Background Radiation, Environment, Neurodegenerative Diseases, Neurological Disorders, SH-SY5Y Cells, Cell Vitality, Cell Metabolism, Cell Culture.

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MLHCS: Multi-Layer-Hollow-Conductor-Systems,
PP-MLHCS: Portable Pets-MLHCS

Introduction

The use of electrical and telecommunication devices has led to a manmade, synthetic propagation of alternating fields for more than 100 years. The extent of biological effects induced by practically useful signals coming from 50/60 Hz voltage-powered electrical devices or by modulated wireless

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data transmission technologies, has been the subject of scientific research for years [1-6]. In addition, a number of preclinical investigations have been conducted to shed a more mechanistic light on the effects of electromagnetic fields on the cellular and molecular level [7-12].

In order to determine the specific effectiveness of MLHCS, different radiation scenarios were designed in the near field of the exposed cells [13]: Firstly, the cell shells were used, secondly, the mobile phone as a near-field radiation source, and thirdly, the antenna wires of the MLHCS were directly galvanically coupled to the mobile phone. The results of the positive effectiveness of using an MLHCS in the test setup have increased from 1st to 3rd, appearing to be more effective as an optimization path of MLHCS development and use.

Since the effects of electromagnetic fields have also been associated with neurodegenerative diseases or neurological disorders, we used cultured neuronal cells to study the effect of environmental background radiation present in common households and its compensation by MLHCS [14-17]. This approach is related to a field trial conducted in a psychiatric clinic in Bavaria from December 2023 until November 2024. At the clinic, more than 11 pieces of so-called H-PLUS-MHRs were installed over a test period of one year. Additionally, it was simply waited to see what random or significant abnormalities might occur in the psychiatric clinical operation sequences. Just a few days after the removal of the MHRs, and particularly within four weeks, there were five police deployments. The situation calmed down afterwards.

Materials and Methods

Multi-Layer-Hollow-Conductor-Systems (MLHCS)

For this study we used the new inductive MLHCS (4.0 prototype 5-way MLHCS-Port and following PP-MLHCS; Figure.1) which should be also effective near a fare-field alternating field source with a field intensity in the range of nanowatt to microwatt. In previous studies the high artificial field intensities of mobile and DECT phones were in the range of milliwatt. In principle, there are two essential factors that differ from the previous investigations between 2017 and 2024 [18-20]: Firstly, the use of neuronal cells to study the possible influence of background radiation on neurological disorders and secondly, the extremely low field exposure which was about 1/1000 compared to previous studies. The experimental setup for the measurement of the environmental background radiation is shown in Figure. 2.

Test Situation

It should also be emphasized that, compared to the previously mentioned studies from 2017 to 2024, a stronger stimulus in the near field, according to a technical radiation emitter, was always used in comparison to a minimum radiation situation without/with our MLHCS, and their respective impacts were compared [18-20]. In the present study, a weak radiation situation was again created as a baseline and reference for comparison. But for statistical evaluation comparison, a typical household radiation situation today with a (5G) mobile phone mast over 500 meters away and an active DECT phone more than 5 meters away (without Wi-Fi), was used as the stimulus. For an approximate check of the electromagnetic field exposures, assessment measurements were carried out with a detector called "5G Esmog Spion" (Endotronic, Argenbühl-Siggen, Germany; measurement range up to 8 GHz) at both incubator places for low and high radiation separately. At the higher-exposed incubator location average values of approximately 10 µW/m² were recorded. At the less-exposed incubator location (cell values control or reference), at least 20 dB (power decibels; roughly a factor of 100) less radiation intensity was measured. Furthermore, the spectral composition of the high-frequency alternating field exposure at the incubator locations for the cell tests was measured with a "tiny spectrum analyzer" (depicted in Fig. 2; measurement range up to 5.6 GHz) and confirmed in dBm in parallel. This means that the mentioned difference in radiation intensity of 20 dB (relative to 10 µW/m²) could also be detected.

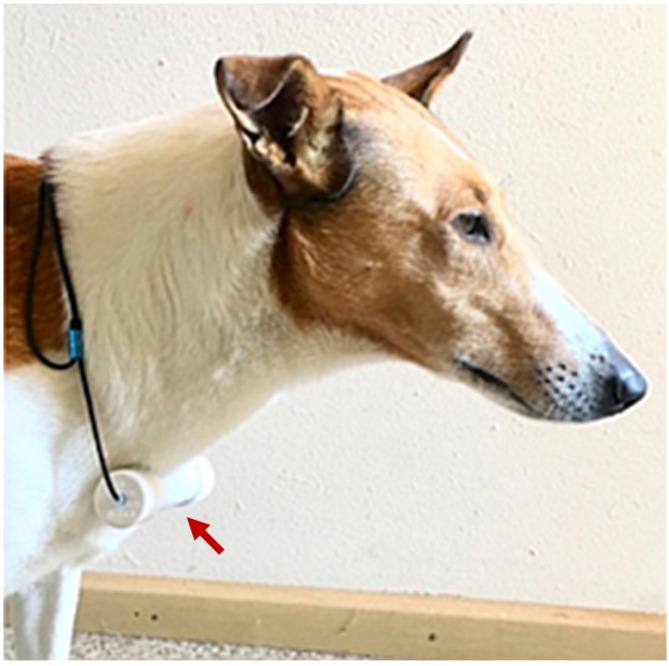

Figure 1: Electrosensitive dog wearing the PP-MLHCS for several months with a positive impact on the dog's behavior

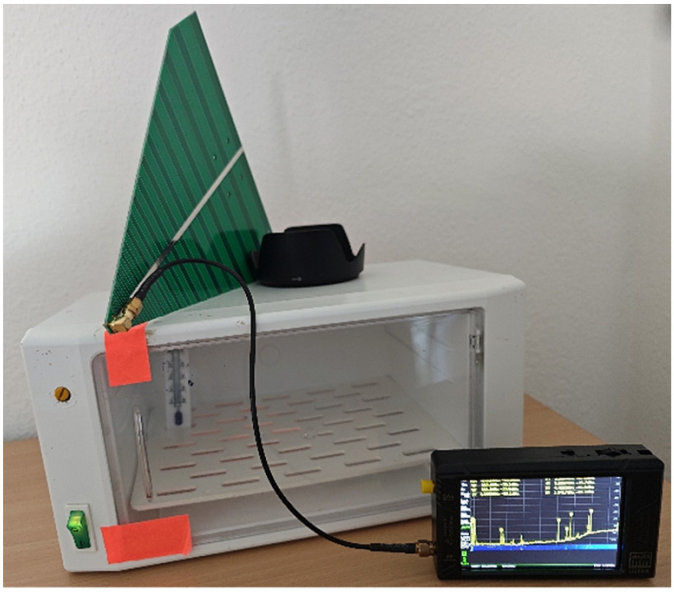

Figure 2: Experimental setup for measuring the environmental background radiation at the test locations.

Cell Culture

SH-SY5Y cells are a clonal subline of a neuroepithelioma cell line that had been established in 1970 from the bone marrow biopsy of a 4-year-old girl with metastatic neuroblastoma. The cell line is a valuable in vitro model for functional studies in neurobiology and the research on neurodegenerative diseases or neurological disorders [21-23].

The SH-SY5Y cells (ACC 209; DSMZ Leibniz Institute, Braunschweig, Germany) were routinely cultivated as mass cultures in a culture medium consisting of DMEM with 1.0 g/L glucose and Ham's F12 (1:1), supplemented with 10% growth mixture and the usual amounts of antibiotics. Cultivation was always carried out in an incubator at 37 °C and a humid atmosphere of 5% CO2 and 95% air. The cells were regularly transferred twice a week, i.e., detached from the bottom of the culture dish by trypsin treatment and seeded into new culture dishes at a lower cell density for further growth. The cells for the experiments were taken from 80 to 90% confluent mass cultures in internal passage 4 to 6.

Examination of Vitality and Metabolism of SH-SY5Y Cells

For the experiments, cells from mass cultures were seeded into 96-well culture plates (200 µl culture medium/well) at a cell density of 100,000 cells/well and incubated for 24 to 48 hours until the cells had completely adhered. Then, cells were incubated for another 24 hours in a mini-incubator together with the MLHCS (Figure 3A) and PP-MLHCS (Figure 3B), respectively. The untreated control cultures were simultaneously placed about 7 meters away and separated by several house walls.

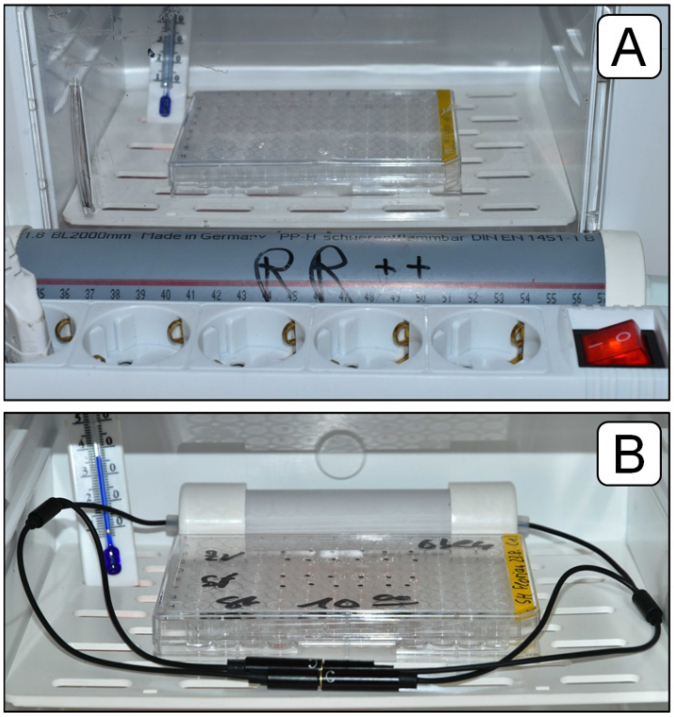

Figure 3: Experimental setup with the cells in multiwells in the incubator using the MLHCS (A) or the PP-MLHCS (B).

For the examination of cell vitality, SH-SY5Y cells were incubated in a reaction mixture consisting of 180 µL/well of culture medium and 20 µL/well of XTT (Xenometrix, Allschwil, Switzerland). For the examination of basal cell metabolism cells were incubated in a reaction mixture consisting of 180 µL/well of culture medium and phosphate buffered saline with 10 mM glucose as an energy source and the tetrazolium dye WST-1 (Sigma-Aldrich, Taufkirchen, Germany). The cleavage of the dyes is directly proportional to the mitochondrial dehydrogenases activity or the cellular energy metabolism, respectively. Finally, the optical density was measured as a difference measurement ΔOD = 450 – 690 nm at definite time points by an Elisareader (BioTek ELx808 with software Gen 5 version 3.00) and analyzed using Microsoft Excel. The study was conducted with 2 independent experiments with 12 replicates for each individual experiment.

Statistical Analysis

Statistical analysis was done using the parameter-free two-tailed Wilcoxon-Mann-Whitney rank sum test.

Results

The initial experimental step of the present study was to assure that vitality and basal metabolism of the neuronal cells responded to background radiation to the same extent after incubation in both spatially separated mini-incubators. As depicted in Figure 4, there was no significant difference in both test parameters between the two incubators. Therefore, we concluded that the background radiation as well as the incubation parameters like temperature stability was nearly identical in both incubators which allowed a direct comparison between the measurement values in the subsequent experiments.

In the first experiment, neuronal cells were exposed to background radiation as above with the use of the MLHCS and without any treatment (= control cells). In comparison to control cells the vitality of the MLHCS-treated cells was improved by 17.7 ± 2.9 % and the basal cell metabolism by 15.9 ± 5.8 % (mean values ± standard deviations). The values differed significantly from the untreated controls ($p \leq 0.01$). In the next experiment, the PP-MLHCS was used vs. control cells. Here, the improvement by the PP-MLHCS was 7.7 ± 2.8 % for the cell vitality and 10.9 ± 3.7 % for the basal cell metabolism (mean values ± standard deviations). These values also differed significantly from the untreated controls ($p \leq 0.05$). In order to see whether the combination of both devices might act synergistically by increasing both measurement parameters to a maximum value, MLHCS and PP-MLHCS were used at the same time vs. control cells. However, the improvement was 13.1 ± 6.3 % for the cell vitality and 18.2 ± 8.4 % for the basal metabolism (mean values ± standard deviations). The values differed significantly from the untreated controls ($p \leq 0.01$), but were not statistically different from the values for the single use of MLHCS and PP-MLHCS, respectively. For a graphical presentation of the measurement data, see Figure 5.

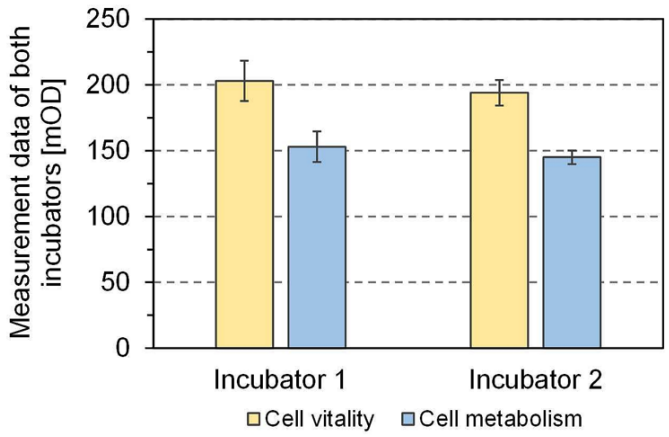

Figure 4: Graphical presentation of the environmental background effects on SH-SY5Y cells cultivated simultaneously for 24 hours in the spatially separated incubators. No significant difference in terms of cell vitality or cell metabolism could be observed. Data show mean values ± standard deviations of two independent experiments with 12 replicates per experiment.

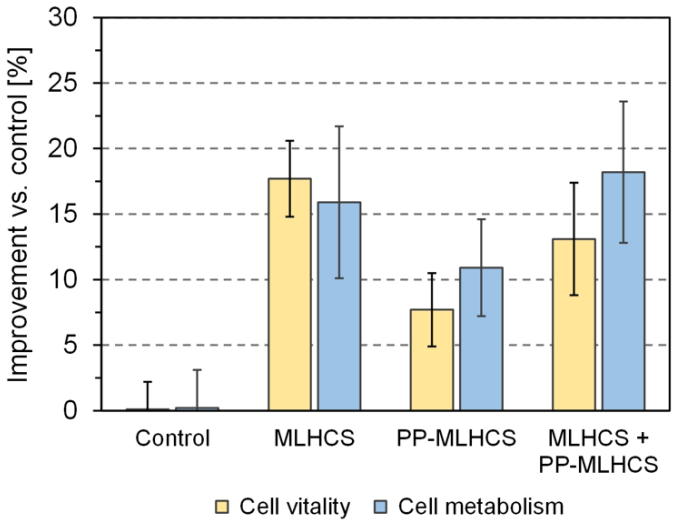

Figure 5: Graphical presentation and comparison of all measurement data on vitality and metabolism of SH-SY5Y cells achieved with MLHCS, PP-MLHCS and the combination of MLHCS + PP-MLHCS. Data show mean values ± standard deviations of two independent experiments with 12 replicates per experiment.

Discussion

Since electromagnetic fields are non-ionizing, conventional genotoxic mechanisms that may be responsible for the interaction with biological systems such as the nervous system still remain unclear [24]. Although changes in the cell cycle, the induction of cell death, the modification of protein expression, and, above all, oxidative stress have been proposed as possible causes, a convincing molecular mechanism linking human diseases to exposure to electromagnetic fields is still lacking [25-26]. Metabolic processes that generate oxidants and antioxidants can be influenced by environmental factors such as electromagnetic radiation, which can magnetically influence chemical bonds between neighboring atoms and alter the energy levels and spin orientation of electrons [27,24].

Our results have demonstrated that the MLHCS and PP-MLHCS are able to promote vitality and metabolism of cultured neuronal cells, possibly by reducing the influence of environmental background radiation causing oxidative stress. Both measurement parameters were chosen because cell metabolism is a fundamental process that plays a critical role in maintaining vitality and overall health in the body. Within the complex network of cells, various metabolic pathways work together to produce energy, synthesize essential molecules, and regulate cellular functions [28,29]. Due to oxidative stress induced by manmade electromagnetic fields including environmental background radiation affecting our body, the nervous system is one of the main targets resulting in neurodegeneration and neurological disorders or diseases [30-32]. This makes it very important to reduce the constant environmental background radiation and a possibly resulting excess of radicals as a trigger for oxidative stress. In the case that oxidative stress is the main stressor of environmental background radiation, the MLHCS and PP-MLHCS act as antioxidants preserving neuronal health [33].

The previously developed standard 3-Way-Out MLHCS-Port (not shown) was also tested with this present experimental setup for its compensation of environmental background radiation. It turned out that this device (originally designed to reduce electromagnetic fields from DECT and/or mobile phones) was much less effective in the present situation of environmental background radiation with a negligible improvement of cell vitality by about 0.2 % and of cell metabolism of 0.3 % [18]. However, the additional use of the PP-MLHCS together with the 3-Way-Out MLHCS-Port improved cell vitality by about 7.2 % and of cell metabolism of 8.6 % suggesting that only the PP-MLHCS was able to reduce environmental background radiation. This means that the further developmental step of the initial device has become effective against the usual or today's typical smart home environmental background radiation as a broadband (low / high frequency) electro-magnetic field impact without any (near field) higher alternating field source intensities in the range of milliwatt or else.

This also means that in earlier experiments and other field trial series, higher radiation source alternating field strengths in the near-field which is, for example, characteristic of used wireless home phones (by a DECT standard) or mobile phones near to a human head [18-20]. In contrast, the present experimental setup is more concerned with testing the background radiation of an urban residential environment. In contrast to, the present experimental procedure was at first more focused on testing the background radiation of an urban residential environment with low- and high-frequency radiation sources [18-20]. In this context, the mini-incubator represents a 50Hz/230-volt radiation source, whose alternating field emission overlaps with the high-frequency, wandering fields of the DECT telephone base station plus a 4G/5G mobile communication transmitter (cell tower) a few hundred meters away from the labor. As a second point and actually the primary motivation (trigger for causal thoughts) of the experiments was the strangely conspicuous patient behavior during highly notable events in a psychiatric clinic in southern Germany in December 2024, which were briefly mentioned in the introduction. The MHRs used at that time from 2023 to 2024

are comparable in their construction and mode of action to the system used here. Consequently, the situation with and without MHRs or MLHCS, as well as the irradiated subject in the context of neurally sensitive or ill patients and the type of cells used for this study, is fully understandable; as well the clinical use of MHRs and MLHCS since 2020 [34]. Let alone, the selected 'neuroepithelioma cell line (SH-SY5Y)' was correctly chosen in the theoretical model as a substitute for neuronally diseased patients. On the other hand, this type of experimental design as well as the experiment itself should be repeated with the specified hardware components to achieve higher result significance.

As a final side note, it should be noted that the construction of the PP-MLHCS device was initiated in the summer 2025 by practical application needs in southern Switzerland with an electro-sensitive dog. Just a few first observations: The dog apparently reacted in a positive way by its behavior to the PP-MLHCS spontaneously over several months until December 13th 2025 (short interview at a conference in Zurich / Switzerland with the dog owner). This similarly showed up with a friendlier temperament toward other dogs until the beginning of January 2026. Perhaps dogs or animals in general could be a good test subjects for future experiments because, due to their instinctive behavior, they are not susceptible to suggestion. These remarkable observations seem to correlate by the results of the in vitro study presented here in which an increased neuronal cell vitality might be also responsible for the promotion of neuronal health in vivo by a reduction of the effects of the environmental (artificial and broadband) background radiation. Possibly, also other (animal) cell types might react in a similar way as the neuronal cells used in this study.

References

1. Ahlbom A, Feychting M (2003) Electromagnetic radiation: Environmental pollution and health. Br Med Bull 68: 157-165.
2. Adey WR (1993) Biological effects of electromagnetic fields. J Cell Biochem 51: 410-416.
3. Sage C, Carpenter DO (2009) Public health implications of wireless technologies. Pathophysiol 16: 233-246.
4. Levitt BB, Lai H (2013) Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays. Environ Rev 18: 369-395.
5. Vijayalaxmi, Scarfi MR (2014) Biological health effects of radiofrequency fields. Int J Environ Res Public Health 11: 9376-9408.
6. Schuermann D, Mevissen M (2021) Manmade electromagnetic fields and oxidative stress - biological effects and consequences for health. Intern J Mol Sci 22: 3772.
7. Goodman R, Chizmadzhev Y, Shirley-Henderson A (1993) Electromagnetic fields and cells. J Cell Biochem 51: 436-441.
8. Panagopoulos DJ, Karabarbounis A, Margaritis LH (2002) Mechanism for action of electromagnetic fields on cells. Biochem Biophys Res Comm 298: 95-102.
9. Naarala J, Höytö A, Markkanen A (2004) Cellular effects of electromagnetic fields. Alternatives to Laboratory Animals 32: 355-360.
10. Blank M, Goodman R (2009) Electromagnetic fields stress living cells. Pathophysiol 16: 71-78.
11. Kovacic P, Somanathan R (2010) Electromagnetic fields: mechanism, cell signaling, other bioprocesses, toxicity, radicals, antioxidants and beneficial effects. Journal of Receptors Signal Transduction 30: 214-226.
12. Tota M, Jonderko L, Witek J, Novickij V, Kulbacka J (2024) Cellular and molecular effects of magnetic fields. International Journal of Molecular Sciences 25: 8973.
13. König FM, Dartsch PC (2024) Observed cell-biological electro-stress reduction effects at artificial differing. J Clin Bio Med Adv 3: 1-11.
14. Terzi M Ozberk B, Deniz OG, Kaplan S (2016) The role of electromagnetic fields in neurological disorders. Journal of Chemical Neuroanatomy 75: 77-84.
15. Wyszkowska J, Jankowska M, Gas P (2019) Electromagnetic fields and neurodegenerative diseases. Przeglad Elektrotechniczny 95: Jg. 1.
16. Funk RH, Fähnle M (2021) A short review on the influence of magnetic fields on neurological diseases. Frontiers in Bioscience-Scholar 13: 181-189.
17. Luo Y, Zhao C, Ren J, Tian L, Pan Y (2025) Neuroinflammatory effects of magnetic fields: insights into glia-mediated secondary cascades and mechanisms. Life Sciences 124061.
18. Dartsch PC, König FM (2017) Neutralization of wireless DECT base radiation by novel resonance devices. Integr Mol Med 4: 1-5.
19. DartschPC, König FM (2019) Comparative investigations on the inhibition of mobile phone radiation by multiple compartment cavity resonance devices. Jpn J Med 2: 363-374.
20. König FM, Dartsch PC (2024) Observed cell-biological electro-stress reduction effects at artificial differing radiation conditions caused by copper tube accessories. J Clin Bio Med Adv 3: 1-11.
21. Murakami Y, Ito M, Ohsawa I (2017) Molecular hydrogen protects against oxidative stress-induced SH-SY5Y neuroblastoma cell death through the process of mitohormesis. PLoS One 12: e0176992.
22. Lingappa S, Shivakumar MS, Manivasagam T, Somasundaram ST, Seedevi P (2021) Neuroprotective effect of epalrestat on hydrogen peroxide-induced neurodegeneration in SH-SY5Y cellular model. J Microbiol Biotechnol 31: 867.
23. Cetin S, Knez D, Gobec S, Kos J, Pislar A (2022) Cell models for Alzheimer's and Parkinson's disease: At the interface of biology and drug discovery. Biomed Pharmacotherapy 149: 112924.
24. Consales C, Merla C, Marino C, Benassi B (2012) Electromagnetic fields, oxidative stress, and neurodegeneration. Intern J Cell Biol 2012: 683897.
25. Valko M, Leibfritz D, Moncol J, Cronin MTD, Mazur M, et al. (2007) Free radicals and antioxidants in normal physiological functions and human disease. Intern J Biochem Cell Biol 39: 44-84.
26. Schuermann D, Mevissen M (2021) Manmade electromagnetic fields and oxidative stress - biological effects and consequences for health. Intern J Molec Scie 22: 3772.
27. Kovacic P, Somanathan R (2010) Electromagnetic fields: mechanism, cell signaling, other bioprocesses, toxicity,

radicals, antioxidants and beneficial effects. J Recept Signal Transduct 30: 214-226.
28. Myers Jr MG, Olson DP (2012) Central nervous system control of metabolism. Nature 491: 357-363.
29. Maiese K (2023) Cellular metabolism: a fundamental component of degeneration in the nervous system. Biomolecules 13: 816.
30. Degan D, Ornello R, Tiseo C, Carolei A, Sacco S, et al. (2018) The role of inflammation in neurological disorders. Current Pharmaceutical Design 24: 1485-1501.
31. Hassan W, Noreen H, Rehman S, Kamal MA, da Rocha JB (2022) Association of oxidative stress with neurological disorders. Curr Neuropharmacol 20: 1046-1072.
32. Dash UC, Bhol NK, Swain SK, Rashmi Rekha Samal RR, Nayak PK, et al. (2025) Oxidative stress and inflammation in the pathogenesis of neurological disorders: Mechanisms and implications. Acta Pharmaceutica Sinica B 15: 15-34.
33. Neves Carvalho A, Firuzi O, Joao Gama M, van Horssen J, Saso L (2017) Oxidative stress and antioxidants in neurological diseases: is there still hope?. Current Drug Targets 18: 705-718.
34. https://fk-e.de/referenz_en.html