

January 12, 2026

Test report

Effects of METAVITAL MNLS-based technology on cultured neuronal and inflammatory cells

1 Background and question of the study

Undesirable environmental influences such as electrosmog, industrial chemicals, xenobiotics, air pollution from fine dust, UV radiation, and many others can cause an increased formation of reactive oxygen species (ROS) or radicals in the body, which overwhelm the body's own antioxidant enzyme systems. The result is oxidative stress, which can damage cells and organs. In the nervous system, for example, damage to lipids, proteins, and DNA can cause neuronal dysfunction and even neurodegenerative and neuroinflammatory processes. In dementia, oxidative damage in the mitochondria, amyloid beta and tau deposits, and inflammatory processes are associated with these diseases.

Multidimensional nonlinear systems (MNLS) are recognized and applied as analysis and balancing systems in complementary medicine that restore the energetic and functional status of an organism. The measurement is based on biophotons. MNLS systems are not yet recognized in conventional medicine.

In this animal-free study with cultured cells, the effects of the MNLS-based system from METAVITAL were investigated at the cellular level. Based on the knowledge of neurodegeneration and neuroinflammation, both neuronal and inflammation-mediating cell types were used. The tests performed here are internationally accepted test procedures in pre-clinical research.

2 Cell cultures

The investigations were performed using two different organ-specific cell cultures: (1) human neuronal cells (cell line SH-SY5Y, ACC 209; DSMZ, Braunschweig, Germany), which are used in current dementia research, and (2) human promyelocytes (cell line HL-60, ACC 3; DSMZ, Braunschweig, Germany), which were differentiated into inflammation-mediating cells (functional neutrophils). Through an oxidative or respiratory burst, these cells

can generate superoxide anion radicals locally in the tissue, thereby contributing to tissue destruction or an inflammatory process.

The cells of both cell lines were routinely grown as mass cultures in their specific culture media in an incubator with a standardized atmosphere and seeded into the appropriate new culture vessels for testing.

3 Test product, exposure time, and test setup

An MNLS-based system from METAVITAL GmbH was provided for the duration of the investigations. It was used in accordance with the manufacturer's instructions, with the biophoton trigger sensor, consisting of a light intensity sensor and an infrared light source, positioned 40 mm below the cell culture dishes or bottles (Fig. 1). Exposure was always performed at 100 % PWM. The signal strength was between 86 % and 91 % and the reflection strength of the signal was always in the green range. The control cells and the treated cells were cultivated in separate mini incubators at 37 °C in a pH-stable culture medium. The two incubators were set up approximately 10 meters apart and separated from each other by several walls.

In preliminary cell culture tests with different exposure times to the infrared light source, we determined that a duration of 60 minutes was optimal for cell activity. Longer exposure times did not change the result.

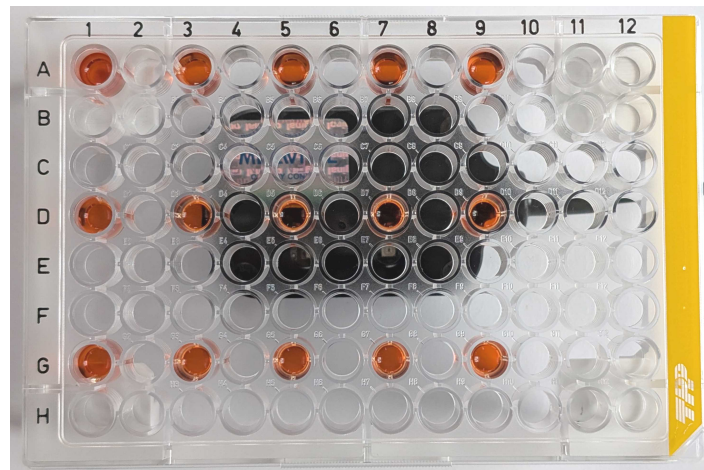


Fig. 1: Experimental setup with a cell culture multiplate 40 mm above the biophoton trigger sensor. This setup was located in a mini incubator with 37 °C using a pH-stable culture medium. The other devices of the MNLS-based system, such as the METAVITAL box and the notebook with the appropriate software for controlling the system, are not shown. The single wells containing the cells are marked by the red culture medium.

4 Tests performed and results

A detailed scientific description of the test procedures is not provided here, as this would detract from the general comprehensibility of the test report. The data can be supplied on request.

4.1 Cell vitality

Cell vitality and cell metabolism are fundamental features for tissue function and adaptability: metabolism provides the energy and substances necessary for growth, differentiation, repair, and signal transduction. This promotes cell vitality and cell health.

The neuronal cells were seeded into the wells of a multiwell culture plate and, after 24 hours of adhesion and spreading and the resumption of cell metabolism, treated with the MNLS-based system for 60 minutes and then cultured for a further 24 hours. The control cells remained untreated. The activity of mitochondrial dehydrogenases was then quantitatively determined using an enzyme test (XTT test). Three independent experiments were performed, each with several replicates.

Result: A single exposure to the MNLS-based system from METAVITAL improved the vitality of the neuronal cells by $10.1 \pm 3.3\%$ compared to the untreated control (mean \pm standard deviation). This difference to the controls was statistically significant ($p \leq 0.05$; two-tailed Wilcoxon-Mann-Whitney rank sum test) and demonstrates the potential of the MNLS-based system. The observed effect after the single application could possibly be significantly enhanced by several consecutive exposures.

4.2 Regeneration

Cell regeneration is a fundamental biological process that enables organisms to replace damaged or dead cells and thus maintain homeostasis. Promoting regeneration can result in an earlier restoration of the integrity and functionality of the affected tissue area.

In this test, the colonization of a cell-free area after 15 hours was determined for the assessment of the cell regenerative potential when treated with the MNLS-based system for one hour directly at the beginning of the regeneration phase. The control cells remained untreated. At the end of the experiment, the remaining uncolonized area was documented using microphotographic series and evaluated with special AI software. Three independent experiments were conducted, each with several replicates.

Result: At the end of the experiments, the remaining area for the cells treated with the MNLS-based system was only $9.4 \pm 2.3\%$ of the total area, while for the untreated cells it was still $15.6 \pm 2.7\%$ of the total area (mean values \pm standard deviations). The difference was statistically significant ($p \leq 0.01$; two-tailed Wilcoxon-Mann-Whitney rank sum test) and demonstrates the stimulation of cell regeneration by a single treatment with the MNLS-based system from METAVITAL (Fig. 2). This allows smaller nerve lesions to heal more quickly.

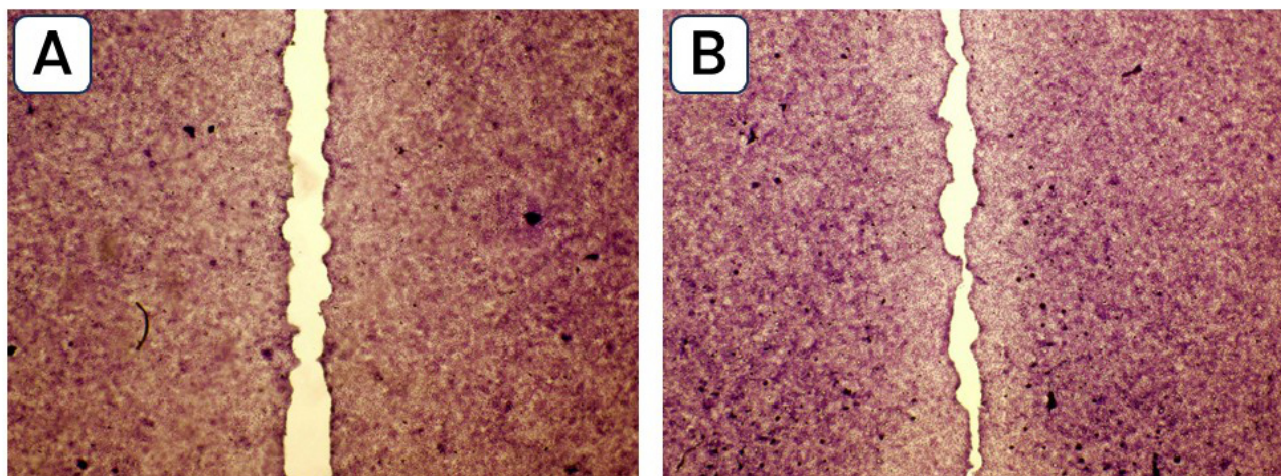


Fig. 2: Microphotographic documentation of the cell-free area remaining after 15 hours in the untreated control cell cultures (A) compared to the cell cultures that had been exposed to the MNLS-based system from METAVITAL for one hour at the beginning of the regeneration phase (B).

4.3 Environmental oxidative stress

After a 24-hour exposure to various concentrations of hydrogen peroxide (0.5 to 2 mM) in the culture medium, the survival/viability of the cells was examined with and without an initial treatment with the MNLS-based system from METAVITAL for 1 hour. This simulated a situation in which environmental influences have a permanent effect on our organism and can lead to undesirable oxidative stress with the resulting health consequences. Viability was measured using an enzymatic test. Three independent experiments were performed, each with several replicates.

Result: As expected, the viability of the cells decreased with increasing hydrogen peroxide concentration in the culture medium. Nevertheless, at all concentrations, the viability of the cells treated only once with the MNLS-based system was significantly better than that of the untreated cells. At the highest hydrogen peroxide concentration, the protective effect of the MNLS-based system on cell survival was greatest at $61.2 \pm 5.9 \%$ compared to the untreated control at only $41.6 \pm 4.3 \%$ (mean values \pm standard deviations). The difference was statistically significant ($p \leq 0.01$; two-tailed Wilcoxon-Mann-Whitney rank sum test).

4.4 Endogenous radical generation in the tissue

In most mammals, neutrophils are the most common type of granulocytes, a specific type of white blood cell. They play a role as phagocytes (= scavenger cells) in the blood as a cellular defense against foreign microbial pathogens and, after migrating into the tissue, as inflammation-mediating cells. An oxidative burst of the cells after stimulation can cause an increased formation of reactive radicals, which (1) kill foreign microbial patho-

gens in the blood and then remove them by phagocytosis, and (2) can trigger inflammatory processes in the tissue.

The cultured promyelocytes were differentiated into functional neutrophils by adding 1.5 vol% dimethyl sulfoxide for 6 days. On the last two days of differentiation, the cells were treated with the MNLS-based system from METAVITAL for one hour each day. The control cells remained untreated. Subsequently, the inactivation of the radicals formed in the course of an oxidative burst was quantitatively determined by the cleavage of a dye. Four independent experiments were performed, each with several replicates.

Result: Compared to the untreated controls, exposure to METAVITAL's MNLS-based system resulted in a stronger and statistically significant reduction in endogenous radical generation in the tissue by 18.8 ± 4.4 % (mean value \pm standard deviation; $p \leq 0.01$; two-tailed Wilcoxon-Mann-Whitney rank sum test). The effect is characteristic for the inhibition of inflammatory processes.

5 Conclusions

Oxidative stress plays a central role in the damage of nerve cells and the development of many neurological diseases. As demonstrated in the cell-based assays presented here, METAVITAL's MNLS-based system has beneficial properties that could counteract neurodegeneration, neuroinflammation and the associated functional disorders, even in a complex organism.

Responsible for the scientific accuracy of the investigations and the content of the test report.



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