



## [APOPTOTIC EFFECT OF ELECTROMAGNETIC FIELD ON ASTROCYTES](#)

**Dinara Begimbetova, Dinara Baiskhanova**

*National Laboratory Astana, Nazarbayev University, Nur-Sultan, Kazakhstan*

[dinara.begimbetova@nu.edu.kz](mailto:dinara.begimbetova@nu.edu.kz); [d.baiskhanova@nu.edu.kz](mailto:d.baiskhanova@nu.edu.kz)

**Keywords: apoptosis, electromagnetic field (EMF)**

**Introduction:** Over the past decade, the use of mobile phones in many countries of the world has increased by almost 100%, and this increase has raised concerns about possible risks to human health. In addition to the emission of mobile phones and, effects of base stations of mobile communication are also possible. Compared to other organs, the brain is subject to relatively high specific absorption rates due to the close proximity of the cell phone device to the user's head. The data show that even ultra-low EMF is powerful enough to disrupt biological processes at the cellular level, but more research is needed in this direction to understand the basic mechanisms.

**Methods:** The experiments used primary cortical astrocytes obtained using the standard procedure for stratification of cells from abortion material of laboratory rats *Rattus Norvegicus*. Portable Faraday cage with electromagnetic signals up to 6 GHz. EMFaraCage® (Standard EMFaraCage® RF Shielding Test Enclosure) was used with the EMF emitted by the antenna. Cells were exposed to EMFs with a power of 900 and 1800 MHz at time intervals of 10, 30, 60, minutes, and 24 and 48 hours. Early apoptosis levels using CellEvent™ Caspase-3/7 Green Detection Reagent (Invitrogen) fluorescence reagents and Propidium Iodide Blue (Invitrogen) late apoptosis on a Cytation 5 multifunction cell imaging reader.

**Results:** The experimental results showed a statistically insignificant increase in the frequency of early and late apoptosis when exposed to EMF with a power of 900 MHz at all time intervals. When exposed to an EMF with a frequency of 1800 MHz, the activation of Annexin Caspase 3/7 and propidium iodide was statistically insignificant in temporary exposures of 10, 30, 60, minutes, and 24 hours. An increase in the level of early apoptosis when exposed to EMF with a frequency of 1800 MHz for 48 hours was statistically significant ( $p \leq 0.01$ ). The level of late apoptosis (propidium iodide) of this exposure remained at the level of intact exposure. Thus, a significant negative effect of apoptosis was noted at its early stage with maximum exposure to EMF. To further study the mechanism of induction of apoptosis of EMF, the genotoxic effect of EMF will be investigated.

**Acknowledgements:** This work was supported by grant to Dinara Begimbetova from MES RK grant AP05133910, "Bio-effects of Electromagnetic Radiation from Mobile Phones and Wi-Fi on DNA of brain cells".