

This abstract is for a presentation made an international conference entitled “The Precautionary EMF Approach: Rationale, Legislation and Implementation”, convened by the International Commission for Electromagnetic Safety and hosted by the City of Benevento, Italy, in February 2006

Weak combined magnetic fields decrease the level of brain beta-amyloid in animal model of sporadic AD

Natalia Bobkova, Vadim Novikov, Natalia Medvinskaya, Irina Aleksandrova, Eugeny Fesenko
Institute of Cell Biophysics, Pushchino, Russia, nbobkova@mail.ru

At present there are inconsistent data about influence of magnetic field (MF) on organism. One authors consider the effects of MF as potential factor inducing many pathology in man, including neurodegenerative diseases [1], other completely deny it [2]. Recently data were appeared about positive effects of MF on cognition and visual memory in patients with Alzheimer’s disease (AD) [3,4]. That opens the new perspectives in AD treatment. Now it is well known that AD is expressed in loss of memory, mental degradation and inability to self-service. There are no effective treatments of AD, and genesis of this pathology is not understood enough. Key pathogenic factor and the main marker of AD are anomalous amyloidosis and amyloid plaque formation in the brain. Beta-amyloid is a neurotoxic agent and kills the neurons. So the efforts of scientists are concentrated on the ways to prevent the deposition of beta-amyloid, to induce its destruction and to delete it from the brain. Really, it was supported by data about recovering of memory after immunization against beta-amyloid in transgenic animals – genetic model of AD. But immunization has many side effects. Earlier we revealed that a weak combined MF (produced by superimposing a variable MF of 0.05 μ T and combined frequencies in the range 3.58 – 4.88 Hz) substantially accelerated the hydrolytic decomposition of beta-amyloid on separated fragments in solution. (5). We suggested that using such a method could decrease the neurotoxicity of beta-amyloid in the brain. Earlier we created the model of sporadic AD in bulbectomized (BE) animals, which demonstrated behavioral, biochemical and morphological features similar to AD [6]. The action of weak combined MF on behavioral and biochemical characteristics was investigated in NMRI mice after the removing of the olfactory bulbs. MF (constant MF – 42 μ T; the amplitude of alternating MF – 0.08 μ T, the frequencies were combined in the range of 3.88 -4.88 Hz, duration of one session was 4 hours, 10 sessions) caused the decrease in the level of brain beta-amyloid without recovering of impaired memory in BE mice. However, the improvement of spatial memory was revealed in sham-operated (SO) animals at the same parameters of MF. The positive effect on memory of SO animals was prolonged and observed in a month after MF action. Thereby, the reduction in level of brain beta-amyloid was shown under MF action in animal model of AD. Probably, the absence of positive effect of MF on memory of BE animals, is a consequence of very hard neurodegenerative process with mass loss of neurons in the brains of these animals. However, we intend that using of MF may be serves as prophylactic preventing the development of AD. Probably, weak MF may be used as well in the case of other diseases connected with amyloid deposits in different organs.

This work was supported by Program of Presidium of RAS “Fundamental sciences to medicine” 2006.

References

1. Hakansson N., Gustavson P., Johansen C., Floderus B // *Epidemiology*. 2003, V.14, 4.P.420-426
2. Noonan C.W., Reif J.S., Burch J.B., // *J. Occup. Environ Med*. 2002, V.44, 8. P.769-775.
3. Sandyk K.R // *Int. J. Neurosci*. 1995, V. 81, 3-4. P. 199-213.
4. Sandyk K.R // *Int. J. Neurosci*. 1994, V. 76, 3-4. P. 185-225.
5. Fesenko E.E., Novikov V.V., Bobkova N.V // *Biophysics*. 2003, V.48, N2. P. 204-206.
6. Aleksandrova Yu., Kuvichkin V.V., Kashparov I.A., Medvinskaya N.I., Nesterova I.V., Lunin S.M., Samokhin A.N. and Bobkova N.V. *Biochemistry (Moscow)*. V.69, N2. 2004. P.176-180.