6 Summary

Electromagnetic exposure effects the hippocampal dentate cell proliferation in gerbils (Meriones unguiculatus).

This is the first thesis to demonstrate that treatment with magnetic fields modulates cell-proliferation in the dentate gyrus. Gerbils (*Meriones unguiculatus*) were exposed to a high frequency electromagnetic field (35,53 kHz), modulated at extremely low frequencies, for 30 minutes a day over a 15 day period. Neurogenesis was determined in animals living under two separate housing conditions. Gerbils which were bred and maintained under restricted housing conditions were treated with a modulated high frequency field at 1, 8, 12, 29 and 50 Hz. Gerbils kept under semi-natural housing conditions were exposed to 1 and 12 Hz-MF. Animals from restricted housing conditions exposed to 1, 29 and 50 Hz-MF showed significant reduction in cell proliferation activity, of approximately 17,3, 16,1 and 29,3 % respectively.

Gerbils in the latter two groups were observed for possible behavioral change during the treatment and 30 minutes afterwards. Animals which were treated with 50 Hz show distinct changes in mobility in the magnetic field. During exposition minor scratching on the wall of the cage (-2,8 %) occures. On the other hand the laboratory animals do more digging than the control animals. Their running activity is reduced (14,4 %), they show less sitting (-61,4 %) and the gerbils don`t sleep in the magnetic field. 30 Minutes after the exposure the 50 Hz-treated animals show more scratching (+23,6%), less digging (-62,1 %), more running (+18,7), less sitting (-22,6 %) and more sleeping (+186,9 %) than the control animals.

The 29 Hz-treated laboratory animals do more scratching (+13,2 %) and digging (+36,8 %) during exposition than the control animals, whereas their running activity is reduced (-13,1 %) and they are not sitting as much as the animals of the control group (-14,6 %). The 29 Hz-animals sleep about 136,4% more than the control animals. Although the 29 Hz-animals show more scratching (+27,7 %) after the exposure, the frequency of digging (-65 %) and running (-26,3 %) is reduced. Sitting (+5,9 %) and sleeping (+717,4 %) frequency is elevated.

MF-exposure of 8 and 12 Hz to gerbils living under restricted housing conditions had no significant effect on hippocampal neurogenesis. Nor were changes in cell proliferation rate to be observed in animals from semi-natural housing conditions treated with 1 or 12 Hz.

Neuroscience is increasingly discovering substances which play a role in regulating neurogenesis in the dentate gyrus. Such regulatory mechanisms, for which magnetic field sensitivity could be demonstrated, are the center of the expository model of the results of this study. Neurotransmitters and hormones, which have been proved to change their activity when exposed to MF, were of particular interest. MF should thus modify neurogenesis, although the initial point of assault of the MF on the organism remains unknown. It is still a matter of speculation, which brain structures could play a role in the perception of MF. Recent studies have shown that there is magnetic material in the brain tissue of mammals and humans. In additions, MF may exert their influence on the brain through changing the activity of the retino-hypothalamo-epiphyseal axis. The function of the pineal gland, especially the release of melatonin, may influence a wide range of other central neurotransmitter functions, particularly dopamine. In this context the influence of MF on the homeostasis of dopamine (restraining control) and its regulatory faculty on hippocampal neurogenesis focuses discussion on this neurotransmitter. Taking into regard other interactive regulatory mechanisms and observed changes in the behavior of the experimental animals, it becomes clear, what a profound influence MF can have on the brain and its efficiency.