Protein Expression at the EMF-exposed blood-brain barrier in vitro

Background
The proper function of the blood-brain barrier (BBB) is frequently discussed in the context of adverse health effects of mobile phone radiation on humans. In particular as a mobile phone is usually held in close proximity to the head, the brain is exposed to higher specific absorption rates (SAR) than the rest of the body. However, the potential molecular targets of the electromagnetic radiation are not precisely known.

By the use of genechips and real-time PCR for analysis of differential gene expression in a previous study, we could identify some genes that showed expressional changes after UMTS or GSM1800 exposure. The genes were encoding for proteins relevant for BBB functionality such as transport proteins, receptors for vasoactive compounds, differentiation factors, factors of signal transduction and tight junction proteins. The aim of this planned study is to investigate, whether the regulation of genes following EMF exposure also accounts for changes in protein expression or functional changes.

Methods
Primary cultures of rat microvascular endothelial cells (RBEC) serve as in vitro models of the BBB. In the same manner as the previous study, these cells will be exposed to either a UMTS or a GSM1800 signal for 3 days. The continual exposure at SAR values of 0.4 W/kg, 1.0 W/kg, 3.0 W/kg or 8.0 W/kg will be conducted in radial waveguide with the field strength and temperature constantly monitored. Selected proteins for exposed cells and sham exposed controls will be characterized by biochemical assays (western blotting, immunocytochemistry, immunoprecipitation) in respect of expression, integrity and localization within the cells. Differentially expressed transporters will be additionally characterized by functional assays.

Expected Results
The results of this study will show, if the proteins identified via genechip analysis of differential gene expression are influenced concerning their expression, structure and integrity by EMF exposure. Functional studies will provide additional information as to a possible molecular effects of EMF on the blood-brain barrier. It is possible to obtain information on a dose-response relationship or to determine a threshold dose. The data thus obtained may serve as (i) a decision-making aid for questions as to the harmlessness of electromagnetic fields emanating from mobile telecommunications technology and (ii) as a basis for a meaningful design for future in vivo animal studies.

Illustrations:

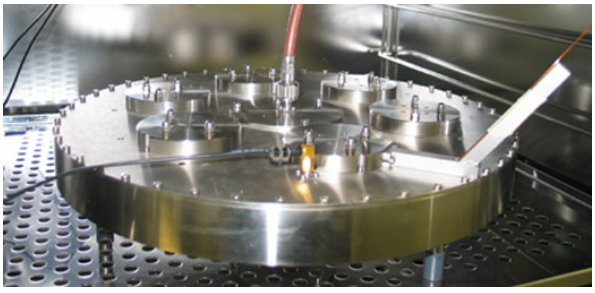

Fig. 1: Radial waveguide for the exposure of cell cultures with EMF

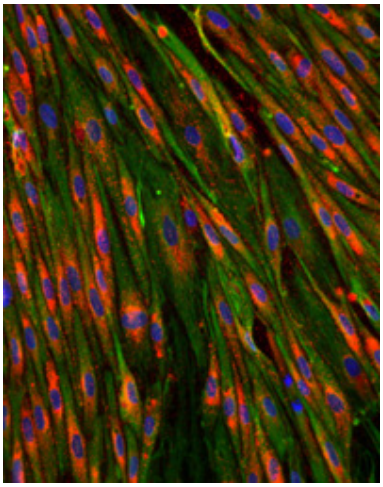

Fig. 2: Immunocytochemical staining of endothelial markers von Willebrand Factor VIII and Vimentin at RBEC cultures