NeuroInflammation and Mobile PHone Exposure (NIMPHE)

Background

There are some controversial findings related to neuroinflammation following exposure to wireless communication signals. There is, however, a trend for the induction of gliosis in the brains of rodents, especially rats. Only two studies have investigated the effects of mobile telephone signals on microglial activation, suggesting that exposure did not affect this cell population *in vivo* or *in vitro*. In only one *in vivo* paper were both cell populations investigated. Notably, only GSM-900 was used in *in-vivo* studies related to neuroinflammation.
Due to its potentially deleterious consequences in terms of brain functionality, neuroinflammation needs to be further, and more thoroughly, investigated.

Objectives

The objective of the NIMPHE project is to carry out an in-depth investigation of neuroinflammation in rats after repeated exposure to two mobile phone signals (GSM-900 and UMTS-1960). A set of neuroinflammation markers will be used as a single marker is unlikely to give the whole picture of glial and microglial physiology. Astroglial and microglial populations and their activation will be explored, and complementary markers will be used for investigating the inflammatory processes.

Methods

The exposure set-up to be used is a loop antenna, which works at 900 MHz and 1960 MHz. The restrainer maintains the head of the animal close to the loop antenna, but depending on the way the body of the animal lays, a gap may exist between the top of the rat's head and the restrainer. We estimated the uncertainty on BASAR levels due to positioning and modelling at around 30%.

Rats will be exposed, restrained, head-only to a GSM-900 or an UMTS-1960 signal. Exposure will last 2 hours/day, 5 days/week, for 4 weeks at Brain-Averaged Specific Absorption Rates (BASAR) of 0 (spurious-exposure group), 0.5, 5, and 15 W/kg. First of all, the rats will be submitted to a one-week, progressive habituation period to confinement in exposure jigs. Animals that will stay in the animal facility over the whole experiment period will constitute the cage control group.

Each group will be composed of 24 animals. A statistically significant ($p < 0.05$) variation of 30% will thus be detectable, with a statistical power of 90%.

Neuroinflammation will be investigated by detecting immunoreactivity for markers including GFAP, Iba-1, CD68 (ED1) and iNOS. The total number of positive cells will be counted in different brain areas including the hippocampus, in the various groups of animals using the optical fractionator method. This is an unbiased stereological method of cell-counting that is not affected by either the volume of reference or the size of the counted elements.

Expected Results

The NIMPHE project will provide extensive information on neuroinflammation under repeated exposures to two types of mobile telephone signals. No study so far has investigated such a panel of neuroinflammation markers using stereological analysis.
Evidence of the presence of several converging end-points will strengthen the conclusion about neuroinflammatory effects of mobile phone signals in the rat.

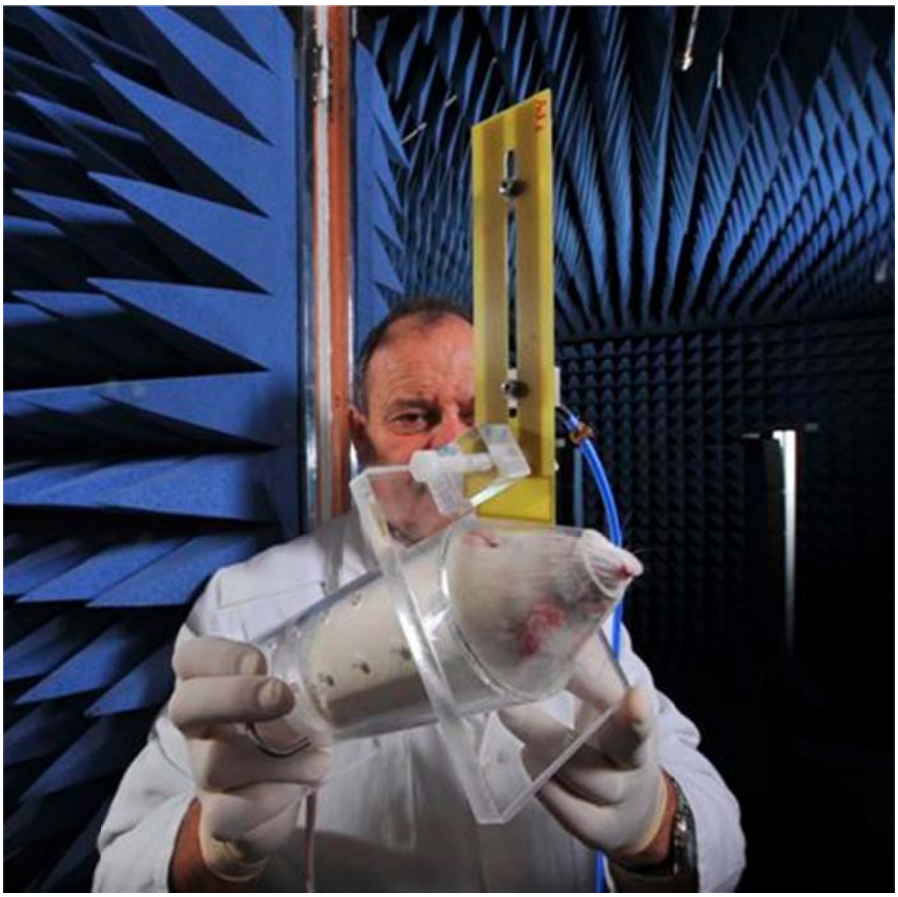

Figure : Head-only exposure set-up : a rat in a jig with the loop antenna