



Abstract

Project No.: A2004-0

Title: Effects of UMTS radio-frequency fields on well-being and cognitive functions in human subjects with and without subjective complaints.

Lemma: TNO replication study and expansion

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Background

In 2003, a Dutch study on the effects of GSM- and UMTS-like electromagnetic fields on well-being and cognitive functions in human subjects was published (Zwamborn et al. 2003, hereafter called TNO-study). In the two groups studied (electromagnetic hypersensitive vs. non-hypersensitive subjects) exposure to GSM-electromagnetic fields had no effect on well-being and did not consistently affect cognitive function, whereas UMTS-like exposure had a negative influence on well-being in both groups. Cognitive function was consistently affected in a positive way in both groups with respect to only one test (visual selective attention test). The TNO-study is of good quality, but criticisms were raised with respect to study design, methodology and analysis.

Objective and Hypothesis

Based on the results of the TNO-study, the objective of the present study is to replicate the effect of electromagnetic fields on well-being and cognitive functions in humans with improved methodology and focus on the UMTS-like exposure condition. Two field strengths will be applied in two groups of subjects with and without subjective complaints about hypersensitivity to electromagnetic fields. Our working hypothesis is that analogous to the original study exposure to UMTS-like radiation will attenuate well-being in both groups, possibly in a dose-dependent manner, but will not affect cognitive performance of the subjects.

Design and Method

The study will replicate the UMTS field condition of the TNO study (1 V/m) using an identical exposure setup and will apply an additional field strength of 10 V/m to establish a dose-response relationship. Three treatments (sham, UMTS 1 V/m, UMTS 10 V/m) will be applied on each subject in a randomized, double blind design. During the treatments, neither the subjects nor the investigators will know whether the subjects are exposed or not, and accordingly they will not know which field-strength will be applied.

The effects of UMTS-like electromagnetic fields will be separately investigated in a group of subjects hypersensitive to EMF (group A) and in a group of subjects without symptoms to EMF (group B). On the basis of the TNO-report, sample sizes for both groups were calculated with a power analysis ($p < 0.05$; power 0.8). The same sample size as in the TNO-study will be used in group A (N=24) where a large difference was found. Sample size in group B will consist of 60 subjects.

Prior to and after exposure subjects will have to fill in an improved well-being questionnaire together with the TNO well-being questionnaire that will be handed after exposure. During exposure subjects will need to perform cognitive tests on a computer.

In addition, organ and functional brain tissue specific dosimetry will be performed.

Outlook

The TNO-study was the first study to investigate UMTS exposure and to indicate a reduction in well-being. In the present replication study, which should be finished within a year, the reliability of the TNO-results will be further clarified. The application of identical exposure conditions and an identical questionnaire as in the TNO-study will allow a proper comparison between the two studies. In addition, the reliability of the original measurements will increase, as a supplementary, improved questionnaire better tailored to the questions at hand will also be applied.

The present study will further establish whether there is a dose-response relationship between electromagnetic field exposure and effects on well-being and cognitive functions and whether the magnitude of any changes in well-being or cognitive functions differs between subjects with and without subjective complaints about hypersensitivity to electromagnetic fields.

The present study will not be able to determine whether a potential decrease in well-being might lead to adverse health consequences. Also, specific mechanisms behind any significant effects on well-being and cognitive functions will not be investigated; however, as dosimetry will be carried out in a more detailed way, additional insights might be gained.

References

Zwamborn APM, Vossen SHJA, van Leersum BJAM, Ouwens MA, Makel WN. Effects of Global Communication system radio-frequency fields on Well-Being and Cognitive Functions of human subjects with and without subjective complaints. Netherlands Organisation for Applied Scientific Research (TNO). FEL-03-C148 (2003).