

Observations on changes in the content of tubulin protein in cell cultures exposed to High Power Microwaves, *in vitro*

M. Risling (1,2); M. Sköld (1,2); E. Malm; A. Sondén (1); I. Larsson (1);

M. Angeria (1); L. Malmgren (3)

(1) Exp. Traumatology unit, Dept. Defence Med., Swedish Defence Research Agency (FOI), Retzius vag 8, B1:5, Karolinska institutet, S-171 77, Stockholm, Sweden;

(2) Department of Neuroscience, Karolinska Institutet., Stockholm, Sweden;

(3) Max-lab, University of Lund, Lund, Sweden

Microwaves have wellknown biological effects that are induced by heating of the tissue. Such thermal effects include burn injuries, pain and increased vascular permeability. High Power Microwave (HPM) weapon systems employ very short pulses of microwaves, which are unlikely to induce thermal effects in biological tissue. In previous studies we have observed transient changes in the structure of cyto-skeletal protein tubulin in endothelial cell cultures. In the present study we have used *in situ* hybridisation and western blots to examine the content of tubulin mRNA and protein in endothelial primary cell cultures and in glioma as well as neuroblastoma cell lines. A HPM source that creates 0.55 microsecond long pulses at 300 Hz was used. The frequency of the waves was 1.6 GHz and the field strength was 22 kV. The cell cultures were exposed for 18000 or 90000 pulses during 1 - 5 minutes. *In situ* hybridisation showed a reduction in the level of mRNA for tubulin. In western blots, an acute reduction the content of tubulin protein could be observed after 18000 pulses. An even more pronounced reduction of tubulin was observed in cultures exposed for 90000 pulses. After one day, the level of tubulin had nearly returned to a normal level in cultures exposed to 18000 pulses. The level of tubulin in cultures subjected to 90 000 pulses was however still reduced one day after the exposure. Similar effects were observed in all examined cell types. Tubulin is a protein that is involved in several cellular functions. The observed changes in the tubulin expression should therefore deserve further attention.