THE APPLICABILITY OF CURRENT AND PAST RF BIOLOGICAL RESEARCH TO NEW TECHNOLOGY (3G): PORTABILITY REQUIRES A MECHANISM

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About 300 biological studies have been initiated using various mobile telephony signals. Even though these studies are comprehensive in addressing current technologies they do not and cannot cover the infinite number of possible frequencies and modulations in use. For example, the majority of these studies utilize generic type GSM signals, but by no means cover all the possible GSM modulation characteristics. Although 3G will utilize a combination of current technologies the future may bring additional variations. Is it necessary to test all possible combinations of frequency and modulation to determine whether or not each signal type will or will not cause adverse health effects, or is current research portable to new technologies? The answer to this question depends on the mechanism of interaction of the RF with the biological system.

A thermal mechanism depends only on the amount of energy absorbed and thus its frequency dependence is predictable. The amount of energy absorbed will depend on the electrical properties of the tissue and the geometrical interaction with the biological object, both of which will cause well-established frequency variations. There is no modulation dependence for a thermal mechanism. A non-thermal mechanism, on the other hand, would be expected to exhibit frequency dependent responses, modulation dependent responses or both. The current 300 mobile telephony studies using all technologies test the hypothesis of whether there is a frequency dependent or modulation dependent response. A workshop was held in May 2001 in Washington DC where a group of experts considered the plausibility of various proposed mechanisms (For a summary see the Research section at http://www.mmfai.org/). This group concluded in part, “For exposures to RF energy from sources in the general environment and from use of mobile telephone devices, the only clearly plausible mechanisms for RF interactions with biological systems involve heating.” This workshop evaluated physical mechanisms of interaction from a theoretical basis only. Subjects considered included: temporal and spatial temperature gradients, alteration of membrane potential, membrane rectification, polarization of structures or molecules, RF pumping and chemical kinetics, magnetic dipole interactions, coherence and cooperative interactions. None, except for thermal gradients, were considered plausible at environmental exposure levels but most required further theoretical evaluation to determine their limitations.

Theoretical examination of proposed mechanisms is one approach that is necessary. A second approach to a determination of possible mechanisms is to study a repeatable biological effect and establish the biochemical and biophysical event that causes this response. An examination of the RF biological effects literature does not provide a consistent body of data that can be used as the basis for formulating theoretical postulates other than a thermal mechanism. There are a number of publications that report effects at non-thermal levels. These reported findings do not build a consistent or connected body of data and thus do not support one another. Support must come from either independent replication or from established biological or biochemical connections in which the occurrence of one finding would predict the second. Science builds upon the mechanistic knowledge gained in one experiment by using it to generate the hypotheses for another experiment. No reported “non-thermal” experimental RF biological effect has been able to be repeated in independent laboratories and connections have not been established between reported findings. In the absence of any plausible mechanism to explain reported non-thermal “positive” findings and in the absence of any consistent or repeatable biological results one must conclude that the only acceptable mechanism is thermal.

Conclusions

To determine whether current experimental findings are applicable to all current and proposed (3G) technologies one must understand the basic physical mechanism that is causing any biological response. At the present stage of RF research, only studies in two main areas, the thermal effects of RF energy and neurostimulation by RF fields and currents, have been established. Theoretical analysis does not provide current support for non-thermal effects. No experimental model has been developed which provides a repeatable non-thermal response. Without such a repeatable response the systematic pursuit of any non-thermal mechanism is not realistic. The lack of evidence or any real indication of a non-thermal mechanism leads one to conclude that current thermally base standards are...
sound and thus all current research findings are portable to all current and new technologies.