Assessing the effects of cell phone radiation on brain tissue

December 17 2012, by Sunanda Creagh

Researchers have found a novel, non-invasive technique for measuring brain hot spots caused by electromagnetic radiation from mobile phones, according to a study published today.

However, the scientists noted their model measured a "worst case scenario" level of heat and that in reality, the body's natural self-cooling mechanisms would reduce the amount of heat rise in the brain caused by a mobile phone.

The World Health Organisation's cancer agency, the International Agency for Research on Cancer (IARC), classed mobile phones as Group 2B or "possibly carcinogenic" in a report released last year. That puts them in the same IARC category as coffee, napthalene and pickled vegetables.

To test how much electromagnetic energy from cell phone radiation was absorbed into a brain, US researchers David H. Gultekin and Lothar Moeller used nuclear magnetic resonance (NMR) techniques on a brain that had been removed from a cow.

The scientists rigged up an antenna system to help create 3D images of the hot spots without allowing the strong magnetic fields of the NMR to interfere with the results.

The results were checked against heat measurements taken with fibre optic temperature sensors and showed that the NMR method delivered

accurate findings.

The researchers concluded that "NMR thermometry offers sufficient spatial and temporal resolution to characterise the hot spots from absorbed cell phone radiation in… biological tissues."

However, the researchers said that a biological process called perfusion—in which blood is directed to overheated body parts to help cool them down—would mean that the amount of heat rise caused by a mobile phone in a living brain would be less in real life than what was studied in this experiment.

"This study essentially presents the worst case scenario in terms of radiation-heated brain tissue. The temperature rise in the in vivo brain tissue is expected to be smaller because of perfusion," the study said.

The study was published in the journal *Proceedings of the National Academy of Sciences*.

Their technique was an improvement on existing methods to test for hot spots, which currently involve inserting a probe into a gel designed to mimic the way a brain would conduct heat.

"They are invasive and they can not measure the thermal fields in ex-vivo or in-vivo tissues. NMR method is non-invasive and can measure the thermal fields in ex-vivo and in-vivo including the perfusion effects," said one of the scientists who conducted the research, Dr David Gultekin from the Memorial Sloan-Kettering Cancer Centre in New York.

Another author of the paper, Dr Lothar Moeller of Bell Labs, said "our method has the advantages that it can be applied to measure remotely temperature enhancement caused by cell phone radiation inside in-vivo brain. No other existing method can do this."

Professor Rodney Croft, Professor of Health Physiology at the University of Wollongong and a researcher of mobile phone radiation said the research was interesting proof-of-concept study but "I don't think it has much relevance to the mobile phone debate."

"What they are talking about at the moment is a non-realistic model using biological material without thermoregulation," meaning natural mechanisms that help cool down overheated body parts, said Dr Croft.

"We can be exposed to quite a lot of changes in temperature and our body can deal with it. If we get mobile phone exposure, because it's such a small amount of heat, the thermoregulation can deal with that without any difficulty."

Dr Croft said there still was no research suggesting major health problems caused by mobile phone use.

"It really doesn't represent much of a risk. We are talking about a conclusion that it remains a possibility [that they may cause cancer] but there is no evidence it is a problem."

More information: "NMR imaging of cell phone radiation absorption in brain tissue," by David H. Gultekin and Lothar Moeller: www.pnas.org/content/early/2012/12/10/1205598109

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