

Researchers study Terahertz radiation's impact on cellular function and gene expression

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Terahertz (THz) technologies show promise for myriad medical, military, security, and research applications ranging from the detection of cancer to airport security systems to shipment inspection to spectroscopy. Relatively little is known, however, about the effect of THz radiation on biological systems. So a team of researchers, led by Los Alamos National Laboratory, evaluated the cellular response of mouse stem cells exposed to THz radiation. They applied low-power radiation both from a pulsed broadband (centered at 10 THz) source and from a continuous wave (CW) laser (2.52 THz) source, and applied both modeling and empirical characterization and monitoring techniques to minimize the impact of radiation-induced increases in temperature.

The researchers determined that temperature increases were minimal, and that [heat shock protein](#) expression was unaffected, while the expression of certain other genes showed clear effects of the THz irradiation. As the researchers describe in the September issue of the Optical Society's (OSA) open-access journal [Biomedical Optics Express](#), mouse mesenchymal stem cells exposed to THz radiation exhibit specific changes in cellular function closely related to the gene expression. They believe further investigations involving a large number of genes and variation in THz radiation characteristics and exposure duration are needed to generalize their findings. They also say that more direct experimental investigations of THz radiation's ability to induce specific openings of the DNA double strand are needed to fully determine how THz radiation may work through DNA dynamics to influence cellular function.

The team, led by Los Alamos National Lab, worked in collaboration with the Center for Integrated Nanotechnologies, a U.S. Department of Energy,

Office of Basic Energy Sciences user facility at Los Alamos and Sandia National Laboratories, and with Harvard Medical School, and Beth Israel Deaconess Medical Center.

More information: "Non-thermal effects of terahertz radiation on gene expression in mouse stem cells," *Biomedical Optics Express*, Alexandrov et al., Volume 2, Issue 9, pp. 2679-2689.

www.opticsinfobase.org/boe/abs.cfm?URI=boe-2-9-2679

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