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Near-Infrared Laser Light of High Energy and Ultrashort Pulse Genetically-Induces Response Genes in the DNA Repair and Apoptosis Regulatory Pathways.

This (Air Force Academy) study shows potential human cell genetic damage from laser light. The use of laser light for targeting devices and weapons has sharply increased the likelihood that aircrew and support personnel will be exposed to laser light during operations.

The increased potential for exposure of humans highlights the need for scientifically-based safety standards for laser exposure at the ultrashort pulse lengths. Current safety standards are largely extrapolations of exposure limits at longer pulse lengths, using a minimal visible lesion endpoint in the Rhesus monkey retinal model. A non-animal model for assessing laser-light damage to tissue, particularly human, is quite desirous for obvious scientific, political, and fiduciary reasons.

The study assesses the sublethal insult to human cells, using a tissue culture system for specific genes that has been shown to be important in several biological processes that could lead to cancer or cell death. Using the CAT-Tox (Xenometrix Inc.) assay, it appears that 1064 nm nanosecond pulses of laser light is sensed, and induces several stress response genes, including p53, a gene in the DNA repair and apoptosis (cell suicide) regulatory pathways, in a dose-dependent fashion. The approach provides insight into a more global methodology for characterizing environmental stressors via genetic profiling.

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