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Cellular tolerance to pulsed heating DMITRI SIMANOVSKII, DANIEL PALANKER, ALAN SCHWETTMAN, Hansen Experimental Physics Laboratory, Stanford University, MAINAK SARKAR, AFRAZ IRANI, CAITLIN C. O'CONNELL-RODWELL, CHRISTOPHER CONTAG, Department of Pediatrics, Stanford University — In many medical applications knowledge about the threshold temperature leading to irreversible cellular damage is critically important. We study the dependence of the threshold temperature on duration of the heat exposure in the range of 0.3 ms to 1 second. Thin layer of cells cultured in a Petri dish was exposed to a pulsed CO_2 laser radiation. Laser beam was focused onto a surface of Petri dish providing Gaussian intensity distribution in the focal plane with a typical beam diameter (2w) 10 mm. Surface temperature in the central part of the focal spot (1mm in diameter) was measured by thermal IR emission from the sample recorded with a fast (ns) MCT detector. For pulses shorter than 1 s the temperature profile across the focal spot was found to closely correspond to the radial distribution of the laser beam, thus allowing for accurate determination of temperature at any given distance from the center of the spot. Immediate cellular damage was assessed using vital staining with the live/dead fluorescent assay. Threshold temperatures were found to vary from 55 ^{o}C at 1 s of heating to 160 ^{o}C at pulses of 0.3 ms in duration. The shorter end of this range was limited by vaporization which occurs during the laser pulse and results in mechanical damage to cells.

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