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BIOLOGICAL EFFECTS AND HAZARDS OF LASER RADIATION¹

by

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TO BE PRESENTED BY

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Biologic Effects of Laser Radiation

The range of biological effects and the potential hazards of laser radiation are increasing as rapid technological advances provide increasing energy and power levels in the ultraviolet, visible and infrared.

Studies were carried out on over 5000 rodents to elucidate mechanisms of interactions of laser radiation at several levels of biological organization as a basis for meaningful applications to biomedical problems and for assessing short and long term hazards. The factors studied included elevation of temperature, phase transformation, pressure waves, back-scattered radiation and particulate matter, formation of charged particles and free radicals.

Thresholds for reversible changes in the intact mammal were approximately 1 joule/cm² non-Q-switched at 6943 Å. Studies at higher energy and power levels were carried out on normal and tumor-bearing mice as "scaled down" model systems to indicate possible effects at higher intensity in larger mammals. Depending on the radiation parameters and the anatomical location of the irradiation site, effects ranged from slight histological changes to severe permanent injury and instantaneous death. Inconsequential superficial injury was accompanied by fatal intracranial lesions, paralysis, cardiac arrest, loss of mobility of extremities and arthropathy. Chronic sequelae included

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neurological changes, chronic inflammation and scar formation.

Effects of laser radiation on Harding Passey melanoma varied from permanent regressions to shortened survival, depending on tumor development and radiation characteristics. Regression was followed by chronic inflammation.

Further studies in vitro and in animals are required for orienting clinical exploration and control of potential hazards as industrial, military and investigative uses of lasers increase.

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