Flash Burn Studies in Volunteers

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Flash burns have been inflicted on 44 white medical students and 22 Negro volunteers. A limited series of skin reflectance studies were performed also on both groups. The purpose of this flash burn program was to investigate the thermal effects of nuclear weapons on unprotected human skin. In particular, the study was directed toward the solution of the following broad questions:

(a) What is the incident dose (cal/cm^2) required to produce first, second, and third degree flash burns on unprotected skin.

(b) What is the difference between burns inflicted by an irradiance which varies with time (thermal pulse) and those produced by an irradiance which is constant with time (square wave) when the dose and time of exposure are held constant.

(c) What is the effect on the burn lesion of exposure time when the thermal dose is held constant.

(d) What part does spectral quality of the radiation play in the production of flash burns.

(e) Does skin reflectance account in large part for the difference in burn severity between white and Negro skin.

Flash burn techniques employing a 24" searchlight equipped with an ellipsoidal mirror will be described briefly, including a shutter used to produce thermal pulses similar to those emitted by a nuclear weapon. The methods used to measure exposure time, irradiance, and spectral quality will be given.

One group of 14 medical students received 168 small burns (7/16" diameter) on the upper arm at doses ranging from 2.0 to 4.8 cal/cm^2. Clinical observations over a period of 49 days allow a rough assay of the degree of thermal injury as a function of dose. A second group of 15 volunteers received 120 burns, 60 of which were delivered by means of a pulse shutter, the other 60 being inflicted by means of a square wave shutter. Comparison of burns by the two techniques will be discussed. A third group of 15 students received 90 burns in which a dose of 4.8 cal/cm^2 was delivered over exposure times ranging from 0.5 to 3.4 sec. The clinical effects of varying the rate of energy delivery will be shown. A final group of 10 white students was used to study the effects of spectral composition on the severity of the burn lesion.

In addition to these studies on white volunteers, a group of 22 negroes was used to investigate the degree of thermal injury as a function of dose, exposure time and spectral quality. Differences in white and Negro susceptibility to burn injury will be discussed in conjunction with skin reflectance measurements. If time permits, a short color film (2 minutes) showing the actual progression of the flash burn on a dog during irradiation, will be shown.