STUDIES ON THERMAL AND OPTICAL PROPERTIES OF SKIN

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The technical difficulties attached to the measurement of skin temperature while the skin is exposed to thermal radiation of high intensity are so great that considerable reliance must be placed upon theoretical calculations. Before dependence can be placed upon such calculations, information concerning the thermal and optical properties of human skin must be available.

Using a thermal radiation of low intensity and measuring the temperature rise of the skin during prolonged exposures to thermal radiation, it has been possible to determine the "thermal inertia for surface heating" (the product of k c, thermal conductivity, density, thermal capacity) for excised human tissues and intact human skin. Values for this product and factors which affect it will be discussed.

Using the goniometric spectrometer absolute measures of the reflectance and transmittance of excised white and Negro skin have been measured from .55 mu to 2.8 mu. The spectral characteristics of the transmittance and reflectance have been found to be characterized by the absorption bands of water. For wave lengths greater than 1.2 mu there is no significant difference between white and dark human skin in respect to transmittance or reflectance. Absorption coefficients measured at 1.2 mu, 1.7 mu, and 2.2 mu indicate that white and Negro skin obey Beer's law with absorption coefficients of .92 $\pm$ .24, 1.34 $\pm$ .283, and 2.95 $\pm$ .45, respectively.

Important differences in transmittance and reflectance for white and Negro human skin are found only in the visible and very near infra-red part. In this region measurements of absorption coefficients near the surface (6 mm^{-1}) and relatively lower absorption coefficients (3 mm^{-1}) for deeper tissues.