there is a measurable period of time between exposure and development of injury; deep burns may be endured without immediate discomfort. The severity of the burn depends upon the spectral distribution of energy in the ultraviolet region, the intensity, and the time of exposure. Certain wave lengths are more effective in producing discomfort and injury than others. Figure 41 illustrates the relative effectiveness of various wave lengths in producing erythema.

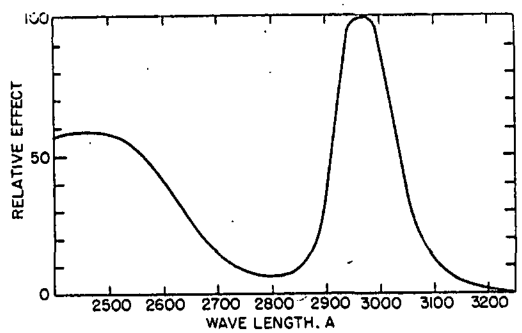

Figure 41. The selective effectiveness of various wave lengths in producing erythema.

Considerable discomfort can be produced in the eye by exposure to radiation below about 3100 A. The absorption of this radiation by the outer layers of the eye (cornea and conjunctiva) produces conjunctivitis, which occurs 4 to 8 hours after exposure and may last several days. While conjunctivitis itself is rarely serious, great care should be taken to avoid secondary infection.

Protective glasses should be worn by all personnel when they may be exposed to erythemally effective radiation. Furthermore, opaque shielding should be used around welding areas to protect other persons.

It has been suggested[67] that 0.5 microwatt per square centimeter be the permissible amount of ultraviolet for a 7-hour continuous exposure or 0.1 microwatt per square centimeter for 24 hours.

[67] Council on Physical Therapy, *J. Am. Med. Assoc.*, **122**, 503 (1943).

CHAPTER XXI

Heat Control in the Hot Industries

T. F. HATCH

This chapter is concerned with the protection of workers in the so-called hot industries where heat exposures are increased substantially above the normal levels fixed by the local climate because of the extra heat added to the environment by the hot processes. Industrial heat exposures may be classified as either *hot-dry* or *warm-moist*. (*1*) In the *hot-dry* industries, such as steel mills, forge shops, and glass manufacturing plants, the thermal load on the worker is increased by the sensible heat that escapes from the process equipment into the surrounding work space. The major component is radiant heat from the surfaces of tanks, hot metals, and the like; the heat load contributed by the surrounding hot air is secondary. No moisture is added to the air so that there is no loss in the evaporative cooling capacity of the atmosphere. The requirements for sweating and evaporation are increased, however, because of the added radiant and convective loads. For men exposed to such conditions, heat balance is maintained by the evaporation of sweat. (*2*) In the *warm-moist* industries, such as laundries, dye houses, and deep mines with extensive use of water for dust control, water vapor is added to the air from wet processes or as escaping steam. Relatively little sensible heat escapes, but evaporative cooling capacity is greatly reduced. In consequence, the worker may be unable to dispose of his metabolic heat plus the small additional heat gained from the environment.

The amount of heat or water vapor added to the environment in the hot industries is usually substantial so that it is not economically feasible to provide sufficient cooling of the air to offset completely the added thermal load. Thus, the comfort standards that have been established for sedentary workers in air-conditioned offices and light industries (Chapter VIII) do not necessarily apply to the design of heat-control measures for the hot industries. Different standards, above the limits of simple comfort, are required and these will vary in respect to the physiological and psychological criteria on which they are based, depending on the kind of industry and the nature of the work. The level of heat exposure must be kept within safe limits to prevent serious physiological disturbance or injury to health. It will be necessary to go further toward the comfort zone in certain industries where impairment of efficiency and other physiological disturbances interfere with effective operation.