

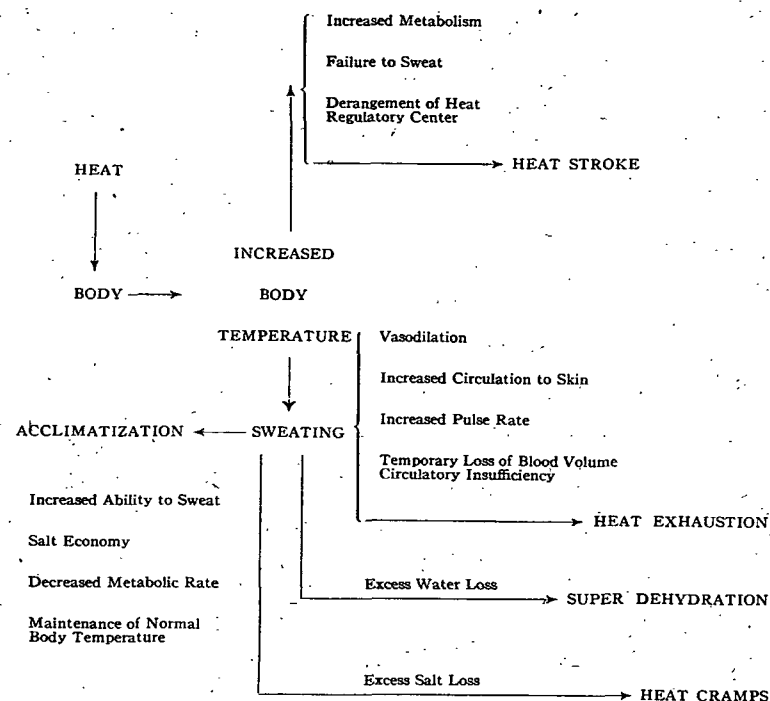


FIG. 2. PHYSICAL EFFECTS OF OVERHEATING AND ACCLIMATIZATION

and heat strokes¹⁹. Heat exhaustion is due to circulatory failure; heat cramps to excessive loss of body chlorides and heat stroke to an inadequacy of the heat dissipating mechanism which results in hyperthermia (high fever) (See Fig. 2). If the hyperthermia becomes excessive, the liver and the central nervous system may be seriously injured and this damage may prove fatal. The hazards of high temperature are not understood. It is difficult to say whether short exposures at high temperatures are more harmful than longer exposures at lower temperatures. A new concept is evident from the observation of an increase in leucocytes (white cells) of the blood in workers subjected to high temperatures. These leucocytes are defensive factors which are increased when infection invades the body. A rise in temperature and leucocyte count indicates a mobilization of the body defenses. Since both temperature and cell count are increased²⁰, the question arises as to whether long exposures to very high temperatures might not cause exhaustion of these defense mechanisms.

A study was made recently at the Armored Medical Research Laboratory²¹ to determine the upper limits of environmental conditions under which a man can perform certain work. Thirteen enlisted men, who were first thoroughly acclimatized to the hot conditions, served as

TABLE 3. UPPER LIMITS OF ENVIRONMENTAL CONDITIONS FOR ACCLIMATIZED, HEALTHY, YOUNG MEN IN MILITARY SERVICE

ENVIRONMENT	REACTIONS AT THE END OF 4 HR	
	Rectal Temp F	Pulse rate
Relatively Easy.....	Below 101	Below 130
Difficult.....	101 to 102	130 to 145
Impossible.....	Above 102	Over 145

subjects. During each test, the subjects were required to march for 4 hr at the rate of 3 mph, carrying 20 lb packs. Tests were made under a wide range of environmental conditions, and these environments were rated in 3 zones as relatively easy, difficult, and impossible, on the basis of the physiological reactions of the subjects at the end of the 4 hr period as shown in Table 3. Fig. 3 shows the limits of the three environmental zones.

Recognition of the need of air conditioning for workers in hot industries is growing rapidly and this should become an important field for the air conditioning engineer. The hot conditions may be remedied by any of the recognized comfort cooling applications. The choice of the type of system and cycle to be used in a given instance must be determined by the air conditioning engineer after a study of surrounding conditions.

In some hot industries where a small number of workers are engaged in spaces of large volumetric capacity the worker himself, rather than the

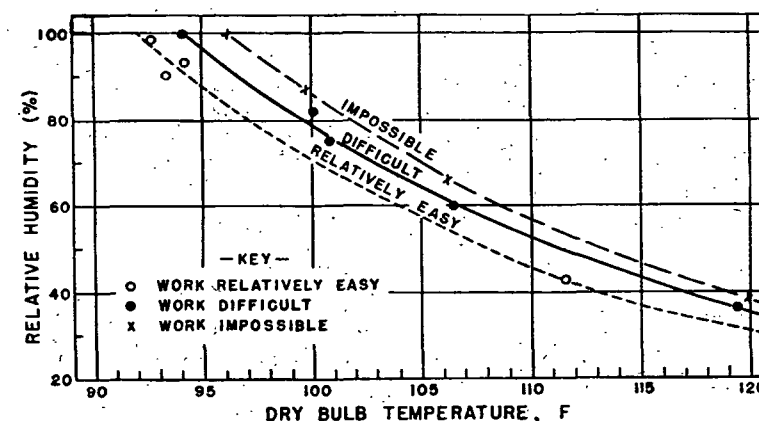


FIG. 3. THE ENDURANCE OF ENVIRONMENTAL CONDITIONS BY ACCLIMATIZED SUBJECTS WORKING AT A SPECIFIC RATE

From The Upper Limits of Environmental Heat and Humidity Tolerated by Acclimatized Men Working in Hot Environments (*Journal of Industrial Hygiene and Toxicology*, March, 1945, p. 70). Used by permission.