heat. They stream with perspiration and drink liquids abundantly to replace the loss.

One of the most deleterious effects of high temperatures is that the blood is diverted from the internal organs to the surface capillaries, in order to serve in the process of cooling. This affects the stomach, heart, lungs and other vital organs, and it is believed that the feeling of lassitude and discomfort experienced is due to the anæmic condition of the brain. The stomach loses some of its power to act upon the food, owing to a diminished secretion of gastric juice, and there is a corresponding loss in the antiseptic and antifermentive action which favors the growth of bacteria in the intestinal tract[2]. These are considered to be the potent factors in the increased susceptibility to gastro-intestinal disorders in hot summer weather. The victim may lose appetite and suffer from indigestion, headache and general enervation, which may eventually lead to a premature old age.

In warm atmospheres, particularly during physical work, a considerable amount of chloride is lost from the system through sweating. The loss of this substance may lead to attacks of cramps, unless the salts are replaced in the drinking water. In order to relieve both cramps and fatigue, Moss[3] recommends the addition of 6 grams of sodium chloride and 4 grams of potassium chloride in a gallon of water.

The deleterious physiologic effects of high temperatures exert a powerful influence upon physical activity, accidents, sickness and mortality. Both laboratory and field data show clearly that physical work in warm atmospheres is a great effort, and that production falls progressively as the temperature rises. The incidence of industrial accidents reaches a minimum at about 68 F, increasing above and below that temperature. Sickness and mortality rates increase progressively as the temperature rises.

Effects of Cold

The action of cold on human beings is not well known. Cold affects the human organism in two ways: (1) through its action on the body as a whole, and (2) through its action on the mucous membranes of the upper respiratory tract. Little exact information is available on the latter.

On exposure to cold, the loss of heat is increased considerably and only within certain limits is compensation possible by increased heat production and decreased peripheral circulation. The rectal temperature often rises upon exposure to cold but the pulse rate and skin temperature fall. The blood pressure increases, owing to constriction in the peripheral vessels and to thickening of the blood. The skin subcutaneous tissues and muscles form reservoirs for storing the water which leaves the blood. In extremely cold atmospheres compensation becomes inadequate. The body temperature falls and the reflex irritability of the spinal cord is markedly affected. The organism may finally pass into an unconscious state which ends in death.

[2] *Influence of Effective Temperature upon Bactericidal Action of Gastro-Intestinal Tract*, by Arnold and Brody (*Proceedings Society* Exp. Biol. Med. Vol. 24, 1927, p. 832).

[3] *Some Effects of High Air Temperatures upon the Miner*, by K. N. Moss (*Transactions Institute of Mining Engineers*, Vol. 66, 1924, p. 284).

Cannon[4] showed that excessive loss of heat is associated with increased activity of the adrenal medulla. The extra output of adrenin hastens heat production which protects the organism against cooling. Bast[5] found a degeneration of thyroid and adrenal glands upon exposure to cold, and some physicians believe that the common use of tonics in spring has something to do with the degeneration of the endocrine glands.

Effects of Changes in Temperature

A moderate amount of variability in temperature is known to be beneficial to health, comfort, and the performance of physical and mental work. On the other hand, extreme changes in temperature, such as those experienced in passing from a warm room to the cold air out of doors, appear to be harmful to the tissues of the nose and throat which are the portals for the entry of respiratory diseases.

Experiments show that chilling causes a constriction of the blood vessels of the palate, tonsils and throat, which is accompanied by a fall in the temperature of the tissues. On rewarming, the palate and throat do not always regain their normal temperature and blood supply. This anæmic condition favors bacterial activity and it is believed to play a part in the inception of the common cold and other respiratory diseases.

Sickness records in industries seem to strengthen this belief. The Industrial Fatigue Research Board of England[6] found that in workers exposed to high temperatures and to changes in temperature, namely, steel melters, puddlers, and tin-plate millmen, there is an excess of all sickness, the excess among the puddlers being due chiefly to respiratory diseases and rheumatism. The causative factor was not the heat itself but the sudden changes in temperature to which the workers were exposed. The tin-plate millmen who were not exposed to chills, since they work almost continuously throughout the shift, had no excess of rheumatism and respiratory diseases. On the other hand, the blast-furnacemen, who work mostly in the open, showed more respiratory sickness than the steel workers. This experience in British factories is well in accord with the findings in American industries[7]. According to these data the highest pneumonia death rate is associated with dust, extreme heat, exposure to cold, and to sudden changes in temperature.

ACCLIMATIZATION AND THE PSYCHOLOGIC FACTOR

Acclimatization and the factor of psychology are two important influences in air conditioning which cannot be ignored. The first is man's ability to adapt himself to changes in air conditions; the second is an intangible matter of habit and suggestion.

Some persons regard the unnecessary endurance of cold as a virtue. They believe that the human organism can adapt itself to a wide range of

[4] *Studies on the Condition of Activity of Endocrine Glands*, by W. B. Cannon, A. Guerido, S. W. Britton and E. M. Bright (*American Journal of Physiology*, Vol. 79, 1926, p. 466).

[5] *Studies in Exhaustion Due to Lack of Sleep*, by T. H. Bast, J. S. Supurnaw, B. Lieberman and J. Munro (*American Journal of Physiology*, Vol. 85, 1928, p. 135).

[6] *Fatigue and Efficiency in the Iron and Steel Industry*, by H. M. Vernon (Industrial Fatigue Research Board, *Report* No. 5, 1920, London).

[7] *Iron Foundry Workers Show Highest Percentage of Deaths from Pneumonia* (*Statistical Bulletin*, Metropolitan Life Insurance Company, 1928).