

in women, and involvement of the eye), syphilis, chorea, infectious arthritis (non-gonorrheal), encephalitis, and some forms of asthma. There are other conditions which show promise under this treatment; but the most striking results are seen in gonorrhea and syphilis, since the causative organisms can be destroyed at temperatures compatible with human life²².

Equipment for Production of Fever

Various means have been tried for producing artificial fever, including injections of various crystalloid or colloid substances, bacterial products of typhoid and malarial organisms; a number of physical methods, such as hot baths, radiant heat, diathermy, radiotherapy, and in the last few years, air conditioned chambers. The relative advantages and disadvantages of various methods have been discussed in a paper²³. The results by the use of air conditioned cabinets have not been fully explored, and it is therefore difficult to determine all the advantages and disadvantages of the value of air conditioning at this time.

In the earlier studies of the Society²⁴, temperatures were elevated more easily using saturated atmospheres. A fever therapy apparatus²⁵ using these same principles has proved efficient as a means of inducing and maintaining fever in a body with small likelihood of burns because of the comparatively low dry-bulb temperatures. This saturation factor is in great use today where fever is created by induction currents by placing the body in an electrical field. When the optimum body temperature has been reached by electrical induction, the atmosphere of the enclosure is kept at saturation to prevent heat loss, thus maintaining the patient's temperature at the desired point. Other apparatus²⁶ which uses electric heaters, centrifugal fans, and a water container for humidification has been used in the past, but the more recent trend is toward saturation with a lower dry-bulb temperature.

When heat is necessary in treating legs or arms, such media as short or long wave diathermy, infra-red, water baths, etc. have been used extensively. A recent development, a saturated atmosphere heating unit, similar to one previously described²⁷ has proven satisfactory, because heat may be administered over longer periods which render deep heating possible without fear of burns or shocks²⁸. Local heating has been somewhat satisfactory in relieving the painful symptoms of peripheral vascular disease.

The final criteria for the use of fever therapy may be changed because

²²Report of the First Year of Fever Therapy Research by the Department of Industrial Hygiene, School of Medicine, University of Pittsburgh, 1938.

²³Fever Therapy by Physical Means, by Frank H. Krusen and E. C. Elkins (*Journal American Medical Association*, 112:1689, 1939).

²⁴A.S.H.V.E. RESEARCH REPORT No. 654—Some Physiological Reactions of High Temperatures and Humidities, by W. J. McConnell and F. C. Houghten (A.S.H.V.E. TRANSACTIONS, Vol. 29, 1923, p. 129).

²⁵A.S.H.V.E. RESEARCH REPORT No. 1054—Fever Therapy Induced by Conditioned Air, by F. C. Houghten, M. B. Ferderber and Carl Gutberlet (A.S.H.V.E. TRANSACTIONS, Vol. 43, 1937, p. 131).

²⁶A.S.H.V.E. RESEARCH REPORT No. 1161—Fever Therapy Locally Induced by Conditioned Air, by M. B. Ferderber, F. C. Houghten and Carl Gutberlet (A.S.H.V.E. TRANSACTIONS, Vol. 46, 1940, p. 307).

²⁷Artificial Fever Therapy of Syphilis, by W. M. Simpson (*Journal of the American Medical Association*, 105:2132, 1935).

²⁸Loc. Cit. Note 24.

²⁹Saturated Atmospheres in the Treatment of Injuries, by M. B. Ferderber (*Industrial Medicine*, 8:256, June, 1939).

of the introduction of certain drugs which appear prominent in the experimental treatment of some diseases for which fever therapy has been efficacious. Preliminary results would seem to indicate that the combination of fever therapy with chemotherapy (sulfonamide) may be the procedure of choice in the treatment of certain chemotherapy-resistant infections²⁹.

COLD THERAPY

In contrast to fever therapy the use of cold as a means of treatment is being investigated. From the available literature³⁰ the chief virtues of cold therapy (cryotherapy) in cancer are the reduction of pain due to extensive growths and the possibility that the process may be arrested. For a localized lesion, ice water between 36 to 48 F is circulated through tubing at the site of the disease for periods ranging from 4 to 48 hr. A later development was the principle of hibernation during which time the patient is kept in an air conditioned space with an environmental temperature between 50 to 60 F for five days. The body temperature is reduced below the critical level of 95 F. Most of the vital processes of life are at very low ebb and this period simulates the hibernation of wild animals. Although the relief of pain is reported, this form of treatment is still in the experimental stage.

It has been demonstrated that the cooling of limbs and other parts with ice-water or ice, cracked or pulverized, down to near the freezing point (5 C or 40 F) is harmless. Freezing must be avoided. There is a temporary retardation or suspension of life, with resumption of cellular activity as the temperature returns to normal. A human limb can remain bloodless and anesthetic below a tourniquet for at least 8 hr and perhaps up to 48 hr without injury, while the rest of the body remains warm. Where amputation is indicated it can thus be done without pain, loss of blood or strength and also without shock. There is no apparent interference with the subsequent healing of the stump. Refrigeration anesthesia is of importance not only in amputation but also in the control of hemorrhage, pain, infection and shock during the transportation of patients with traumatized limbs. A portable electric refrigerative apparatus is in use at the New York City Hospital³¹. There is a growing feeling that cooling the body is of great importance in the treatment of shock. Extensive research is in progress to determine what degree of heat or cold is most efficacious in obviating or treating secondary shock³².

HIGH TEMPERATURE HAZARDS

Diseases due to heat are now classified as heat exhaustion, heat cramps, and heat strokes³³. Heat exhaustion is due to circulatory failure; heat

³⁰Temperature Factors in Cancer and Embryonal Cell Growth, by L. W. Smith and Temple Fay (*Journal of the American Medical Association*, 113:653, 1939).

³¹Combined Artificial Fever-Chemotherapy, by H. W. Kendell, D. L. Rose and W. M. Simpson (*Journal of the American Medical Association*, 116:357, 1941).

³²Experiments on Pelvic and Abdominal Refrigeration with Special Reference to Traumatic and Military Surgery, by F. M. Allen (*American Journal of Surgery*, 55:451, 1942).

³³Cooling in Shock—Editorial (*Journal of the American Medical Association*, 121:432, 1943).

³⁴Heat Disease: Clinical and Laboratory Studies, by M. W. Heilman and E. S. Montgomery (*Journal of Industrial Disease and Toxicology*, 18:351, 1936).