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DIVISION OF HUMAN PHYSIOLOGY

These experiments form part of a series of fundamental physiological studies on the effects of elevating body temperature above normal. In this experiment the twelve subjects are Army volunteers from the Royal Sussex Regiment, with a sergeant (Sgt Briggs) and officer (Lt Taylor) in charge, and their body temperatures are being raised to  $37.5^{\circ}\text{C}$  ( $99^{\circ}\text{F}$ ),  $37.9^{\circ}\text{C}$  ( $100^{\circ}\text{F}$ ) and  $38.5^{\circ}\text{C}$  ( $101.5^{\circ}\text{F}$ ) and then kept at these levels for 2 hours daily for 2 to 3 weeks. During the 2 hours each day with raised body temperatures, the subjects perform three simple tasks:

1. A test of alertness, in which the subjects listen for special signals coming through earphones and report their occurrence by pressing a switch.
2. An adding test in which the subjects add up columns of figures as quickly and as accurately as they can.
3. A test requiring rapid hand movements and quick judgment. The subjects have a board with five lights arranged in a circle and a second board with five metal studs arranged in the same pattern. One lamp is lit and the subject has to touch the corresponding metal stud with an electrified stylus; this changes the light to another lamp and again the subject has to touch the corresponding metal stud and so on. He has to operate as quickly as he can and avoid making mistakes.

It is hoped to find out whether raising body temperature alters the performance of the subjects in these tests and how, with repeated daily treatments, the body adapts to the situation.

Although the principal aim of the experiment is to add to our knowledge of how our bodies work, it is also of practical value to the Army. In adverse conditions in hot climates, body temperature often rises above normal and it is important to know how much, and in what ways, this may affect efficiency.

The experiment begins with the subjects in a rest room where they are weighed. They then sit outside the sauna where their special mouth thermometers are inserted. After this they enter the sauna which is a room through which hot air (temperature =  $110^{\circ}\text{F}$ ) completely saturated with moisture (R.H. = 100% with visible steam) is blown at 500 ft./min (6 m.p.h.). They stay in this room for 4 to 10 minutes while the temperature controller watches their body temperatures rise; when it reaches the required level he tells them to leave the sauna and dress in PVC vapour-barrier suits which completely enclose the body except for the face, which prevents <sup>ing</sup> their sweat from being evaporated by the atmosphere and cooling them. Dressed in their suits they enter a second room with the air at about body temperature and recline in deck-chairs for their 2 hours of treatment. During this period they perform the series of tests and physiological measurements are obtained. Body temperature is watched continuously by the temperature controllers and maintained at the target level by blowing a variable amount of dry air into the suits. If no air is blown into the suits body temperature slowly rises. Air blown into the suits evaporates sweat on the body and cools the subject by the latent heat of evaporation. Thus, by varying the rate at which air is blown into the suits the amount of cooling can be altered and body temperature kept constant at its new level. The air flowing to the subjects' suits is controlled by taps and measured with rotameters.

At the end of the 2 hours the subjects leave the hot rooms, are weighed, have a shower and then eat a hearty lunch.

This particular group of men have done extremely well and are among the best subjects we have had so far. During the period of body heating they are uncomfortable and they are glad when the daily session ends. Nevertheless, they say it makes a pleasant change from their usual duties. For the afternoons, when they are free to do as they please, the officer has fixed up an intensive programme of sight-seeing tours, with free tickets to shows and entertainments in the evening. At the end of the experiment they will have some extra leave.