covered until 3 months of age or more, has no valvular defects and shows very considerable increase in heart weight due to gross left ventricular hypertrophy.

On morphological grounds anoxia of the cardiac muscle during cardiac development seems to offer the most acceptable explanation of the changes found at post-mortem examination in foetal and infantile fibro-elastosis, and a possible mechanism for this is offered.

The connexion between foetal and infantile fibro-elastosis and the endocardial sclerosis found in adults is discussed.

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"There is at present a sickness in our country—a sickness of rumour and anxiety, of suspicion and distrust, and, at its worst, of fear and tragedy," said Dr. WEAVER, President of the American Association for the Advancement of Science, in his introductory remarks to the address of the retiring president (*Science*, February 18, 1955). Analysing the causes of this sickness, Dr. Weaver blamed the lack of "constructive courage with respect to the future," the strange lack of faith in scholarly competence, and the misguided zeal of sincere persons with mistaken ideas of good citizenship. At its worst the disease was "the result of political pressure, of personal selfishness, and of the pathological demagogues with small and nasty minds." The effect of these general and recurring fears was that confidence in government promises and even in the "Anglo-Saxon tradition of due process" had been destroyed. Commenting on the universality of this sickness, Dr. Weaver pointed out that science voiced its concern at it, not to demand protection for itself, but primarily because the problem was a universal one. As a remedy he called for the abandonment of timidity, and in its place a "really sensible, constructive stand," giving the warning that wit and patience must be used because "freedom is too precious to deserve rash or stupid support." He hoped that government concern "to improve the whole loyalty-security-secrecy setup" was a sign that the sickness of his country was waning, and at that actual meeting they were celebrating a "rededication to liberal decency."

SOME EFFECTS OF HIGH-ALTITUDE CLIMBING

INVESTIGATIONS MADE ON CLIMBERS OF THE BRITISH KANGCHENJUNGA RECONNAISSANCE EXPEDITION, 1954

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During the 1954 British Kangchenjunga Reconnaissance Expedition the opportunity was taken of carrying out certain biochemical and microscopical analyses of blood and urine samples obtained by the expedition medical officer (D.S.M.) from climbers at various altitudes. These were sent by runners to Darjeeling and dispatched by aeroplane to the Medical College, Calcutta, for assessment. Although many expeditions to the Himalayas have been made, there has unfortunately been little scientific liaison between them. We understand that samples of blood were collected from climbers of the successful 1953 Everest Expedition and sent back to England for analysis. We have not seen the results of those analyses or of any investigations that may have been conducted by other parties. Referable literature is difficult to obtain.

General Observations

A significant feature worth noting in relation to this expedition was the fact that it was primarily a reconnaissance. Knowing this, the party would be less likely to experience the anxiety stresses that are often associated with the anticipation of future efforts required in attempting to reach the summit. It is usually only at levels above those reached on this expedition that the almost inevitable deterioration occurs, no matter what degree of acclimatization is simultaneously taking place.

Our approach to Kangchenjunga was along the Singalila ridge—a high-level route throughout—which, although relatively arduous, must have been responsible for the high degree of acclimatization attained by all members of the party when base camp 18,000 ft. (5,500 m.) was reached on the eighteenth day out. No climber suffered from headache, nausea, or undue breathlessness except that three members experienced occasional spells of characteristic rapid periodic breathing. Sore throat and gastro-enteritis were rare, and there were no cases of frost-bite. Some of the porters who did not wear sunglasses complained of photophobia, and a mild conjunctivitis was found on examination. It was a revelation to watch some of the porters, barefooted, carry loads through snow and ice, and sleep at night in the open with scanty clothing—such is their ability to acclimatize to cold. The sherpanis—we had 16 of these female porters—performed their duties as well as most of the men.

Rothera tests were performed on numerous occasions on the mountain, particularly after climbers had made

exhausting ascents. On only one occasion was acetonuria found to be present, and that was on the third day out from Darjeeling at 11,000 ft. (3,350 m.). Of the two climbers who had a trace of acetone in their urine, one had enteritis. However, some morning urine samples taken on the mountain and sent to Calcutta contained acetone as detected by the Rothera test. We are at a loss to explain the disparity between the results of tests performed on the mountain and those in Calcutta, unless it is that the mountain tests were performed on samples collected in the evening and those tested in Calcutta were morning urine specimens.

Despite efforts to encourage all climbers to drink large quantities of fluid, the specific gravity of urine specimens obtained from climbers after a day of exertion frequently ranged between 1030 and 1040. It proved impracticable to estimate the total urine output in any one day, but it was apparent that this was reduced. Although members were often dehydrated, thirst, like appetite, tended to be depressed.

The liability to shock following even minor injuries incurred while climbing at high altitudes is noteworthy. It would seem to be somewhat comparable to the increased liability to shock of a woman after a lengthy confinement. One of us suffered a lacerated finger with avulsion of the extensor tendon from the distal phalanx as a result of a blow from falling rock. The degree of shock was out of all proportion to the severity of the injury. Another climber received a lacerated scalp injury from a falling rock. Although the initial shock was minimal, some delayed reaction occurred later. He was confined to bed for 48 hours and forbidden climbing for the remaining week of the trip. Chlortetracycline (aureomycin) was administered on one occasion, but so severe were the toxic effects that the drug had to be stopped. Many of these effects, such as headache, nausea, and vomiting, are aggravated by anoxia.

The following changes in behaviour and thought were noted at the higher altitudes. Memory and concentration were impaired. For example, attempts to memorize from the *Oxford Dictionary of Quotations* failed. When using the cinematograph camera the operator would often forget to turn back the turret after rewinding. Only a routine automatic action can be reliably performed. One periodically became aware of a feeling of mental lethargy, with the result that there was a tendency not to push things to a satisfactory conclusion in the face of difficulties, even though one's physical prowess might not have been exhausted. At meetings held to discuss plans, thinking was not always incisive and conclusive. Insomnia was common; discordant restless mental activity often continued far into the night. Dream content was vivid, as though one had a high fever. There were frequent requests for sleeping pills. It is probable that the effects of altitude were responsible for some unruly behaviour on the part of the porters. Discipline was not always easy to maintain.

Laboratory Investigations

We were hindered by unforeseen difficulties in our attempt to carry out prearranged investigations. The samples were flown to Calcutta from Darjeeling, but there was much unavoidable delay in getting the specimens down to Darjeeling, with the result that many of the blood samples were found to be haemolysed or decomposed when they arrived at the laboratory. The effect of heat would also be responsible for this deterioration. At that time the Calcutta area was in the grip of a heat wave, when the maximum temperature in the shade reached 110° F. (43.3° C.). It is significant that the blood samples taken in Darjeeling and examined in Calcutta during this unusually hot weather were unsuitable, whereas many of those taken later on the mountain were satisfactory. In some cases the blood had completely leaked out of the containers, although they

appeared to be leak-proof in the laboratory before packing. Care was taken on the mountain to ensure that the screw caps were tightened. The reduced atmospheric pressure at high altitude might be responsible for this leakage. We could not, therefore, obtain as many samples from various altitudes as we had hoped. On blood samples, haemoglobin percentages were estimated from iron analyses, a method which is considered by King and his associates (1947, 1948a, 1948b) to be the most reliable, although, of course, it is not absolutely free from error, because a certain small proportion of the iron, from 0.1 to 0.3 mg., is present per 100 ml. of cell-free plasma. Estimations of sodium, potassium, adrenaline, and sugar could not be done. For the study of white cells we had to be satisfied with a differential leucocyte count taken from thin films made on the mountain and sent down to the laboratory. Urine samples were tested for acetone, and quantitative analysis of chlorides was performed.

Haemoglobin Content of Blood.—Samples of blood from six climbers collected at 17,000 ft. (5,200 m.) and from four climbers collected at 21,000 ft. (6,400 m.) were available for examination. Of those collected at 17,000 ft. the iron content ranged from 52.6 to 95 mg. per 100 ml. of blood, with a mean of 74.1 mg. per 100 ml. Translated into grammes of haemoglobin per 100 ml., this comes to 15.7 to 28.4 g. per 100 ml., with a mean of 22.18 g., the percentage of iron content in haemoglobin being 0.334% (Hupfner). Of the samples collected at 21,000 ft. the iron content ranged from 57 to 64.5 mg. per 100 ml., with a mean of 61.6 mg. (17 to 19.3 g. of haemoglobin per 100 ml., with a mean of 18.4 g.).

Chloride Content of Blood.—Estimation of chloride on the above-mentioned blood samples showed a range from 419 to 620 mg. per 100 ml., with a mean of 509 mg.

Leucocyte Picture.—Films from four climbers collected at 17,000 ft. (5,200 m.) and from one collected at 21,000 ft. (6,400 m.) were available for examination. A study of the stained thin films did not suggest any lymphocytopenia or any significant eosinopenia; nor was there any suggestion of a qualitative change in the lymphocytes as found by Frank and Dougherty (1953) in their experimental studies on the effects of stress.

Acetone Bodies in Urine.—Of the two samples of urine collected from two climbers at Darjeeling, neither showed the presence of acetone bodies. Of the six samples collected from six climbers at an altitude of 17,000 ft. (5,200 m.), two gave definite reaction for acetone bodies, one gave a doubtful reaction, while the remaining three gave negative reactions. Of the two samples collected at 21,000 ft. (6,400 m.) from two climbers, both gave a definite reaction for acetone bodies.

Urinary Chloride and Creatinine.—Two samples of urine from 6,700 ft. (2,040 m.), six from 17,000 ft. (5,200 m.), and two from 21,000 ft. (6,400 m.) were available for examination. The mean chloride contents were 1.34 g., 0.878 g., and 0.7 g. per 100 ml. respectively, and the mean creatinine contents were 0.108 g., 0.128 g., and 0.169 g. per 100 ml. respectively.

Summary

A study of the climbers taking part in the 1954 British Kangchenjunga Reconnaissance Expedition was made in an attempt to assess some of the physiological changes which occur at high altitudes. Some general clinical observations are made on the stresses which occur. The results of a small number of blood and urine analyses are recorded.

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