in 1920. I saw the sister of this patient in a severe attack in March, 1920, and in February, 1921, she had a still more serious attack, in which some of the nodules became vesicated and ulcerated. The mother of the two girls had erythema nodosum in 1886, and her oldest daughter died in 1889 during an attack of tonsillitis and erythema nodosum with endocarditis and pericarditis. There was a strong rheumatic family history, and several members of the family had suffered from multiple attacks of scarlet fever, measles, and diphtheria, so their case might be used equally well as an argument for or against the theory of infection.

Certainly second attacks are more common in this disease than in scarlet fever, but they are not of such frequent occurrence as to support the view that the disease is a blood dyscrasia due to rheumatism, tuberculosis, or other chronic constitutional weakness. I have not heard of a person suffering from more than two attacks.

Conclusion.

I do not regard the evidence I have been able to bring forward as conclusive. The strong points in favour of the theory that erythema nodosum is an infectious fever are the proof that it may be transferred from person to person and may occur in small localized outbreaks and in epidemic waves. Equally convincing is the evidence of a definite seasonal incidence and constant age incidence. The systematic distribution of the rash, the evidence of relapses, and conferment of immunity are also favourable to this view. On the other hand, one has to explain the constant association of erythema nodosum with other diseases, such as tuberculosis, measles, and minor conditions of ill health.

The heavy incidence of the disease on girls at and about the age of puberty is difficult to explain on any ground of infection, and we also have to decide whether erythema nodosum and erythema multiforme are but two phases of the same disease, or whether they are two clear and distinct entities.

REFERENCES.

¹ BRITISH MEDICAL JOURNAL, April 15th, 1911. ² Brit. Journ. of Child. Dis., July, 1907.

MOUNTAIN CLIMATES IN HEALTH AND DISEASE.

BY

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THE object of this note is to set out, briefly and concisely, the principal physiological and therapeutic effects of high altitudes upon the organism. As one ascends to a higher altitude the barometric pressure falls, there is a lower tension of oxygen in the air, and at the same time there is a fall in temperature. There is also increasing dryness of the air, which becomes more marked the higher one goes. As a result of the absence of moisture in the air the radiant power of the sun increases, and this is helped by the freedom from smoke and (in winter, at any rate) from dust. During the winter, when the snow is down, the radioactive power of the sun appears to be even greater than during the summer. Much interesting information may be obtained on this subject from the classical work, *The Therapeutics of Climate*, by the late Dr. W. R. Huggard of Davos.

Upon the healthy person the general effects of altitude are as follows: The tissue changes go on more rapidly, the respirations and pulse are quickened, and the body temperature tends to be slightly higher than at sea level; one is living at a greater rate, so to speak, in the mountains. Another important point is that at sea level the normal red blood count is approximately five million corpuscles per cubic millimetre, and the percentage of haemoglobin about 90; at an altitude of, say, 5,000 ft., the blood, in order to compensate for the diminished tension of oxygen in the air, becomes richer both in red cells and in haemoglobin, the ordinary estimation of a healthy person at this altitude being seven million red cells per cubic millimetre, and about 100 per cent., or even more, of haemoglobin. The essential facts here appear to be the change in the percentage of haemoglobin, and this is directly proportional to the altitude, and thus, of

course, to the diminished oxygen tension of the air. The highest percentage of haemoglobin ever recorded is, I believe, 150 per cent., which was reached by one observer at a height of 12,000 ft. There is, however, another factor to be considered in regard to the process of "acclimatization." Under the lowered pressure of a high place, and, of course, proportional to the height, the internal pressure of the body gases is altered, and is always tending to equalize with the external pressure, and until this is accommodated there is increased internal pressure, which may help in producing many of the sensations experienced at first, even at a moderate height—say, 5,000 ft. This process of acclimatization takes from a week to a fortnight to accomplish itself, however, and as a result on first going to a high altitude people often feel uncomfortable and short of breath on slight exertion, and may experience cardiac palpitations and sleeplessness, with lassitude and malaise.*

At high altitude persons breathe deeper, and there is a tendency to expand the lung more than at sea level. The vital capacity also is increased. This feature is valuable in the treatment of chronic pleuritis with adhesions, and in pulmonary disease of the fibrotic type generally; also in adenoids.

From this brief summary of the chief physiological effects of altitude, it is plain that we have here a valuable and powerful therapeutic aid, if applied with care and common sense and to the correct type of case. My remarks are based upon observations made at an average height of 5,000 ft. above sea level, which, taking it all round, appears to be the most advantageous altitude as a therapeutic agent. The modern tendency of treatment is to try to increase the reactive power of the patient, rather than to attempt a direct attack on the disease itself, and this is clearly the line of procedure to take up in such a disease as pulmonary tuberculosis, where direct attack is often impossible. Since the increased metabolism at high altitudes must tend to heighten the reactive power and power of resistance, this therapeutic agent offers the best means at present available for the treatment of pulmonary tuberculosis in properly selected cases. I will first endeavour, therefore, to sketch out the types of case most likely to benefit from a stay in the mountains, and then will enumerate certain cases which should never under any circumstances be sent there.

Healthy people may thus derive great benefit from a holiday in a mountain station, and perhaps the three weeks that many spend at Christmas time in some of the Alpine resorts give the greatest possible value, as regards a holiday, that can be obtained, especially to the hard-worked professional man.

Tuberculosis: Indications and Contraindications.

Tuberculosis is, perhaps, the condition most closely associated with mountain treatment, and it is certain that there must be some good reason for the great reputation which the mountains have won for the cure of tubercle, more especially tubercle of the lungs. First, it is clear from what has already been said, that the main general principle the physician should bear in mind when deciding whether a particular patient is a suitable type of case for a high altitude must be his reactive power. And this is where the judgement of the doctor must be carefully exercised, but the following few remarks may serve as a guide in forming an opinion.

To begin with, there is no doubt that the best type of pulmonary tuberculosis to treat in the mountains is an early case in a young or middle-aged subject, if of a good general constitution, and with sufficient resistance and vitality to react properly to the increased rate of metabolic activity which occurs at an altitude. But later cases of a chronic and partially arrested type undoubtedly do very well in the mountains, especially those in which the disease appears to have come to a standstill and the patient is "sticking"; the mountain climate seems to give this type of case just the necessary amount of stimulus or "kick" to enable him (or her) to improve.

The patients who should never be sent are those in the

* An interesting account of mountain sickness and the sensations experienced at great altitudes—for example, 8,000 to 20,000 ft.—will be found in *Travels amongst the Great Andes of the Equator*, by Edward Whymper, where the effects of very high altitudes (and consequently low pressures) are carefully analysed as regards pulse, body temperature, breathing capacity, fatigue, and general sensations, etc.

advanced third stage of the disease, emaciated by toxæmia and fever, and enfeebled by the strain of prolonged and active disease. All that the mountains do to such cases is to hasten the inevitable end; the invalid, worn out by disease and with resistance gone, cannot react to the altered conditions. Unfortunately, only too often is this kind of case sent out, generally as a sort of last hope at the patient's own wish, for treatment at a mountain resort, the tendency in England, I fear, being to keep the slighter cases at home and deny them the advantages of altitude treatment, until they are too far gone for cure. If the mountains are to do their best for a patient he should be sent as soon as the diagnosis has been definitely made.

Patients with acute inflammatory conditions, severe secondary infections, or those with large septic cavities, do not, as a rule, do well in the mountains. On the other hand, the bronchial and bronchiectatic cases often derive much benefit, the catarrh and the amount of sputum sometimes diminishing greatly. Patients who have had attacks of hæmoptysis are often told that they should not go to a high altitude; this is true for those with cavities and a tendency to big hæmorrhages, especially where the blood pressure is raised, but it does not at all apply to the blood spitting of early or relapsing cases of phthisis; these generally do remarkably well.

The same may be said of laryngitis. Patients with this complication are often discouraged from trying a mountain climate. Here again one must distinguish between the advanced destructive tuberculous laryngitis of the third-stage case and the ordinary and very common complication of laryngitis in the earlier stages. I have often been struck with the way in which these latter cases heal up and resolve, the whole process becoming quiescent and the patient regaining almost full strength of voice. This is especially striking in those common cases where the laryngitis is really a chronic catarrhal condition associated with the pulmonary tuberculosis, and not a true tuberculous laryngitis.

Again, it is often said of patients that "So-and-so could not possibly come to a high altitude, as he (or she) is suffering from a weak heart." In my experience, practically the only kinds of weak heart that should never be sent are cases of organic valvular disease which is extensive and not properly compensated, and cases of endocarditis which tend to be acute and are likely to relapse. The myocardial type of case may gain great benefit from a mountain climate, under careful observation. I have had many patients under my care who arrived in a most apprehensive state of mind as to whether they would be able to stand the height owing to their cardiac condition, but found in a short time, when they became acclimatized, that they were more comfortable, felt better, and could do more than they ever did at home.

I have been told over and over again by patients that they were dissuaded from trying Switzerland as a health resort because they had been told that it was much better to be cured in the country and climate in which they were ultimately going to live, and that if the cure was effected in the Swiss mountains they would have to live there always, and would relapse on returning to England. This, of course, is mere rubbish, and it is not right to discourage early cases should these patients wish to try what the Alps will do for them. By such discouraging and deterring "proverbs" many early cases, which are most suitable for the Alpine climatic treatment, and would probably gain great benefit therefrom, are prevented from coming until too late, with the result that we tend to get in Switzerland many advancing and severe second and third stage cases, which can, at the best, only hope for a "patch up"; even these often regain a certain measure of health and strength, and learn to rely upon the mountains for the winter. We see these people coming out year after year for the worst of the English months, knowing that it is during these months that the Alpine climate is at its very best.

Cases of chronic pleurisy with thickening and adhesions, and consequent poor expansion of the lungs, are likely to be much benefited, owing to the deeper breathing required by the lower tension of oxygen in the air.

Cases of surgical tuberculosis are very suitable for treatment in the mountains owing to the greater amount of sunshine and increased radio-active power of the sun, especially during the winter months.

Conditions other than tuberculosis which may be greatly benefited by the Alpine climate are anaemia, bronchitis and emphysema, asthma, and neurasthenia due to over-work or business worries. Predisposed ("subtuberculous") children are enormously improved in their health by the open air and sun treatment; in certain resorts open-air schools exist. Enlarged tonsils and adenoids in children, associated with general maldevelopment and backwardness, do very well in the Alps, as also does debility during convalescence from acute illnesses. The mountains are contraindicated when there is great general enfeeblement due to a long-standing chronic disease, and the resistance and reactive power are much reduced. Cases of uncompensated valvular heart disease should not be sent to a mountain climate, nor should those with an abnormally high blood pressure. The high mountains are also, as a rule, unsuitable for chronic kidney disease and rheumatism, especially chronic muscular rheumatism.

Heliotherapy.

For certain cases the sun is a most valuable therapeutic agent, and this is a fact which nobody who has had any experience of its effects will ever gainsay, especially as regards the treatment of localized or so-called surgical tuberculosis, and as a prophylactic in predisposed children. The high altitudes are essentially favourable for the sun cure. In low-lying places the sun has to filter through the whole thickness of the atmosphere, with its attendant moisture, smoke, dust, and micro-organisms, which form a sort of veil preventing much of the sun's power from penetrating. In the high altitudes this is not so, and here, especially when the snow is on the ground, the sun is astonishingly powerful, even in mid-winter. Sun-bathing consists in slowly and methodically training the body to become accustomed to the direct rays of the sun; as a rule, the treatment should be commenced with the lower extremities, then extended to the legs and abdomen, and finally to the back and chest, until the whole body is inured to the effects of the sun. This tolerance is attained only by deep pigmentation of the skin. The sun appears to have the following actions: first, it exerts an analgesic effect, and pain gradually decreases and finally disappears; it also has an absorbent effect on local tuberculous lesions, such as enlarged glands, chronic peritonitis, and foci in the bones and joints; it seems also, in some way, to cause absorption of adhesions; we find movement being restored in old ankylosed joints. Cold abscesses even, if not too big, are sometimes absorbed under the sun treatment, without having to be aspirated. The general condition of the patient is improved under a course of sun baths, the muscles keep their tone and do not waste, the appetite improves, and the general vitality is much increased.

Besides tubercle, excellent results are obtained by sun treatment in cases of burns, ulcers, old wounds, chronic inflammatory conditions, fistulae, and similar lesions. The sun cure is contraindicated where the temperature tends to be over 100° F. at night. In those individuals who do not pigment it is impossible to carry out the sun cure. As a rule, the greater and deeper the pigmentation the better the result. Very fair or red-haired people do not stand the sun as well as darker types. Whilst heliotherapy is of such great value in local tuberculous or simple inflammatory conditions, it is unsuited for cases of tuberculosis of the lungs, and, in particular, must never be applied if there is any tendency to active disease. Exposure to the sun in these cases is almost certainly followed by congestion of the tuberculous foci, with consequent rise of temperature, increased sputum, probably hæmoptysis, and may be the means of lighting up the whole disease. It is, however, conceivable that a modified sun treatment could be worked out in certain of the more chronic types of pulmonary tuberculosis—those which approximate to a local or surgical lesion, such as chronic pleurisy or local fibrotic patches; even then it will probably be found impossible to expose either the chest or the head to the direct rays. At an altitude where the radio-active power of the sun is so great pulmonary cases should always be warned not to sit about in the sun but always to keep in the shade, and especially guard against the direct sun upon the head or chest. Many new-comers with pulmonary lesions fall into this mistake and sit out in the sun, thinking it will do them good, and are surprised to find that the reverse is the case.

The following table shows the sort of way in which the sun treatment is begun and developed :

First day: Ten minutes on feet to ankles.
Second day: Ten minutes on legs to the knees and twenty minutes on feet to ankles.
Third day: Ten minutes on legs to the hips and twenty minutes on feet and legs to knee.
Fourth day: Ten minutes on back of legs to the hips and twenty minutes on the front of legs.
Fifth day: Ten minutes on the lower trunk and fifteen minutes each back and front of legs.
Sixth day: Increase a little the exposure of the trunk for ten minutes and twenty minutes each back and front of legs.
Seventh day: Ten minutes' exposure of the back and the rest of the body as for the sixth day.
Succeeding days: Increase gradually the amount and length of times of exposure until the whole trunk, except the head and neck, is exposed for about two and a half hours' total time.

Before deciding on any particular climate for a patient two factors must be carefully considered: the demand for tissue change made by the climate and the individual patient's power of responding to this demand. A young robust person with sound digestion, heart, etc., and with much reactive power and resistance, needs a wholly different type of climate from the elderly and feeble patient, with poor digestion, indifferent kidneys, and weak circulation. These are two extreme types, but I wish to urge the great importance of considering these points before recommending a climate, whether at a high altitude or otherwise, for any particular case. In mountain climates, where there is a demand for an increased and higher rate of metabolism, people who do best are naturally those able to respond and react to this increased call upon the constitution. Thus it is that the early cases in young and middle-aged people are those which do best in the mountains; and next in order comes the more advanced or partially arrested case, where, however, the general constitution is still good and the patient can respond satisfactorily to the demands of the mountains. The second group often derive great benefit from the extra stimulation and "flip," caused by the climatic conditions of a mountain resort.

Another important point to be thought of is the mental side of the question; patients who have to lead the sedentary quiet life necessary to the treatment of this unhappy disease will be more cheerful and in better spirits in the bright sun and clear blue skies of an Alpine climate, especially in the winter months, than in the average weather conditions prevailing at that period in our own island.

ELEVEN THOUSAND CASES OF SPINAL ANALGESIA.

BY

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DURING the past ten years I have performed 11,000 surgical operations under stavaine spinal anaesthesia. As this is probably as large a number as any individual British surgeon has done, I desire briefly to place on record my experiences. The methods which I now employ represent an evolution which gradually, during the past three or four years, crystallized itself into the following procedure:

I use a platinum needle about $2\frac{1}{2}$ inches long, and not much stouter than an ordinary hypodermic needle. I prefer the patient seated, with the back arched, on the operating table, when that position is possible. I select whatever intervertebral space is indicated, and insert the needle in the middle line immediately above the lower spinous process of the space. Generally one feels and hears the penetration of the membranes, and the cerebro-spinal liquid should flow in a jet, or at least in rapid drops. I remove a quantity of fluid equal to the volume of the solution to be injected.

The solution used is made up in ampoules (furnished by the Maison Clin of Paris), containing about $7\frac{1}{2}$ c.cm.; to that I add an ampoule containing $\frac{1}{2}$ mm. or 1 mm. of strychnine. The full dose of $7\frac{1}{2}$ c.cm. suffices for a prolonged operation (such as a double hernia, a double hydrocele, with, perhaps, a ventral hernia in addition). That dose produces complete insensibility for at least one hour, and no operation should last longer than that.

I find that this method is employed by me in 97 per cent. of all operations performed. The exceptions are made up of operations on the head and neck, for which spinal analgesia is neither easy nor efficient. Many opera-

tions on the head and neck are done under local anaesthesia, and a very small minority under chloroform or ether. Spinal analgesia I use for all abdominal operations—hysterectomy, ovariectomy, appendectomy, nephrectomy, splenectomy, liver abscess—and for thoracic operations, such as empyema, thoracostomy, necrosis of ribs or clavicle.

With regard to dosage the following figures may be taken as a rough guide; at the same time, old or feeble patients should have a little less, and children of, say, 5 or 6 years about one-third of the dose (with upward gradation according to age): Hernia (double), $7\frac{1}{2}$ to 7 c.cm.; abdominal and thoracic operations, 7 c.cm.; hydrocele, $6\frac{1}{2}$ c.cm.; bladder (tumours, stones), 6 c.cm.; leg (amputations, fracture setting), 6 c.cm.; rectum (haemorrhoids, fistula), 5 c.cm. Let me here say that if indications of an overdose are manifest, such as pallor, anxiety, nausea, the best treatment is 2 tablespoonfuls of brandy by the mouth and 20 cg. of camphor oil by the skin, with artificial respiration in extreme cases.

Advantages.

1. Rapidity. By the time that the patient's skin has been painted with iodine and the surgeon has put on his gloves—say, three minutes—the patient is ready.
2. No anaesthetist is necessary. For those 11,000 operations I have been my own anaesthetist.
3. Relaxation of the parts. A surgeon who relies on a general anaesthetic has no conception of the facility and simplification of procedure wherewith a splenectomy, a nephrectomy, a hernia, or even a haemorrhoids operation can be performed under spinal analgesia.
4. Absence of vomiting and of shock. Frequently a patient returned to the ward after a nephrectomy will smoke a cigarette immediately.
5. Safety from serious sequelae. In septic operations, such as gangrenous or purulent appendicitis, and in septic wounds necessitating intervention, a general anaesthetic gives rise to acetone and other forms of fatal poisoning, to heart failure, and often, I am sure, to endocarditis with dangers immediate and remote. I desire to emphasize this, for they are factors of the most serious import often unconsidered and denied by surgeons.

Disadvantages.

I know of only one real disadvantage, and that is persistent headache. I have been unable to eliminate entirely that drawback. At the same time it occurs chiefly after minor operations, such as haemorrhoids and uterine curettage, and is largely due to the fact that the patients will sit up and jump about in bed. If they will rest quietly in the recumbent position, not only is there assured absence of real headache, but the rapid and complete success of all operations is thereby enhanced.

Let me state the fancied objections in order to refute them. One is told of the horror of being awake while an operation is going on. I have never found any one worry about that during the operation. Occasionally a patient will raise objections which, as afterwards confessed, were inspired by a medical man ignorant of the technique of the procedure. Among my patients Europeans of every nationality and, above all, native Egyptians clamour for its use.

The method of spinal anaesthesia, like the administration of all anaesthetics, has to be learned; failures of all kinds diminish as experience increases. Chloroform can always be administered if the stavaine should fail. But failures will be few. In remote districts especially, it is of priceless value. With its aid I should not hesitate to remove a gangrenous appendix and so save a life, even had I no one to help me except an intelligent nurse.

In conclusion, I should be indeed ungrateful if I did not acknowledge the great help, in counsel and in deed, that I have received in strenuous hospital labours from my principal assistant and colleague, Dr. Iatrou, and from past assistants in Dr. Schlesinger and Dr. Kaim.

DURING the period 1913-1916 tuberculosis in Germany increased by 26.2 per 100,000 inhabitants in the urban population and by 16.2 in the rural population; in 1916-17 by 62.6 and 31.9 respectively; in 1917-18 by 32.7 and 16.6, and in 1918-19 by 14 and 16.1 respectively. The highest mortality was between the ages 15 and 30, then between 30 and 60, and lowest between 1 and 15.