particularly when they are not ulcerative. All cases of suspected pulmonary tuberculosis should have the larynx examined as part of the diagnostic procedure, and patients under treatment for pulmonary tuberculosis should have regular periodic laryngeal examinations.

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SOME OPERATIVE FACTORS OF SEASIDE CLIMATE

BY

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Many thousands of delicate children are successfully treated each year in convalescent homes and hospitals at the seaside. General experience goes to prove that the results of treatment are as good in winter as in summer, despite the fact that the climatic conditions of the two seasons are widely different. Either the seashore, the sea air, or something else at the seaside has a specific action on the human body independent of the season, or very dissimilar physical and meteorological influences must produce an identical result upon the human body.

Investigations into Basal Metabolisms of Patients

To decide this fundamental question I have carried out determinations of the metabolism (oxygen consumption) of patients in the Royal Sea Bathing Hospital at Margate. The thirteen patients selected were boys between the ages of 7 and 15 who suffered or had suffered from extrapulmonary tuberculosis. During the period of the investigations

(September to November, 1939) they were convalescent or at least apyrexial; they had been at Margate for several months, in some cases for many months. The investigations demanded that the determinations should be made under the established conditions of hospital life. The patients lie in bed in the open air throughout the day. They are dressed in night-shirts and jerseys and are well covered with blankets. During the autumn and winter only hands and head are exposed to air, winds, and sunshine. As a rule the determinations

have been made with the patient's bed in its normal situation; only occasionally have I moved beds in order to give a greater or less exposure to wind. I have used the portable Benedict apparatus throughout.

I knew that the influence of the sun upon human metabolism was somewhat different under basal conditions from what it was after meals during the peak of specific dynamic action. Man lives under basal conditions only in the very short time between awaking and breakfast, and I needed natural conditions. I have taken the hours between 10 a.m. and 12.15 p.m. and 2 p.m. and 4 p.m.

The results are given graphically below. The height of the columns gives the oxygen consumption in c.cm. per minute, reduced to 0° C. and normal barometric pressure in the usual manner. Those who are in the habit of thinking in terms of calories may get the twenty-four-hour metabolism by multiplying the numbers by 7.15. The outlined columns are the controls, taken indoors and therefore uninfluenced by sun or wind; the hatched columns represent readings of metabolism taken in cooling winds, sometimes of considerable velocity; the black columns show the metabolism of subjects exposed to the sun's rays. The controls agree with the usual prediction tables for basal metabolism or lie a few cubic centimetres above them. The metabolic rate is increased in the open air both in sunshine and with exposure to winds of strong cooling power. In each investigation I have made a practice of determining the skin temperatures of the uncovered hands, of the arms covered by the sleeves, and of the forehead. I give here only the average of numerous determinations in degrees centigrade:

	Forehead	Arm	Hands
Indoor... ..	30.5	29.4	25.8
In wind... ..	27.6	29.0	20.6
In sunshine... ..	31.2	31.7	25.5
In sunshine and wind... ..	30.3	31.9	21.8

The skin of the hands alone shows any pronounced decrease of temperature as the result of the cooling effect of wind. Decrease in temperature of the skin of the forehead is prevented by capillary reaction. The above

figures go to prove that the increase of metabolic rate produced by cooling winds cannot be ascribed to simple chemical heat regulation, but belongs to a quite different group of phenomena. Cold and sunshine are stimuli that raise

the metabolic rate even if only a relatively small area of the body's surface is exposed to their influence.

Climatic Factors at the Seaside

The first observer to remark a rise in metabolic rate produced by the radiation of the sun was Leonard Hill. With stronger radiation, such as is met with in summer and at high altitudes, I have seen much greater increases in metabolism: I have observed in healthy adults rises of

Graph showing readings of basal metabolism taken under different conditions. Outlined columns = controls; cross-hatching = exposure to cooling winds; black columns = exposure to sun rays.

80 to 90 c.cm. per minute (Kestner, 1926). The skin of the face is the most important "point of attack," perhaps the only one. My conclusion is that there are at least two climatic factors at the seaside. Meteorologically they are quite different, but they have the same influence upon the human body. Both factors are also present in the climate of altitudes, which is shown by medical experience to have a curative action similar to that of the seaside. At the seaside during winter the rise of metabolism is due to cold winds; during summer to sunshine; during autumn, the period when these investigations were undertaken, to a combination of the two. The optimum results for convalescent children at the seaside have often been obtained in the winter months at German and Danish resorts (Haeblerlin, 1934).

The sunshine values set out graphically are determined on days with clear sunshine, sharply defined shadows, and blue sky. I have made other determinations when the sun was more veiled. The air was warm, but shadows were less clear-cut and the sky bluish white. In sunshine of this type the metabolic rate was not increased. A series of readings on patient Gy. illustrates this point:

	Indoor	Veiled Sun	Clear Sun
Oxygen	202 c.cm.	198 c.cm. 205 " 205 "	234 c.cm. 233 " 220 " 224 "

Intermediate weather conditions give intermediate results.

Bright sunshine with a blue sky is, we know, rich in the wave-lengths of ultra-violet radiation, which have a curative effect upon rickets and which produce sunburn (Kestner and Borchardt, 1927). But there must also be present in bright sunshine of this type another factor—a set of wave-lengths which influence metabolism—since, while they are rich in antirachitic and bronzing power, the rays of carbon-arc and mercury-vapour lamps have no influence upon metabolism (Nothhaas and Schadow, 1930).

It is evident that the factors which raise the metabolic rate and which have curative properties go hand in hand, for they are common to the climates of the seaside and of mountain altitudes, both of which produce these phenomena.

Conclusion

I asked at the beginning of this paper whether it was possible to ascribe the physiological properties of a seaside climate to its well-recognized meteorological features. The question can be answered in the affirmative, as regards at least these two factors which influence metabolism.

I wish to offer my thanks to the Committee for Research on Delicate Children at the Coasts and to the medical superintendent and staff of the Royal Sea Bathing Hospital for their assistance in these investigations.

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A New Meningitis Virus.—From two cases of mild lymphocytic meningitis in children a virus which differs from any other known virus was recovered by the intracerebral injection of the cerebrospinal fluid into mice. It is proposed to call this disease pseudo-lymphocytic choriomeningitis.—Pseudo-lymphocytic Choriomeningitis. F. O. MacCallum, G. M. Findlay, and T. McN. Scott.—*Brit. J. exp. Path.*, June, 1939; 20, 260.

ABACTERIAL PYURIA

BY

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Pyuria is definite evidence of inflammatory changes in some part of the urinary tract. The causative organism can usually be grown from the urine. When such is not the case there is a strong suspicion that a tuberculous infection is present. Thus it has become almost axiomatic in urological practice that sterile pyuria means urinary tuberculosis. More recently it has been realized that this general rule is not always true. In this paper it is intended to discuss these cases of non-tuberculous sterile pyuria and to report a case which illustrates the excellent result of adequate therapy.

There are some non-infective causes of inflammation in the genito-urinary tract. The constant irritation of a stone in the renal pelvis, for example, may lead to pyuria in the absence of infection, which, however, usually supervenes sooner or later. It is not uncommon in other parts of the body for the organisms causing inflammation to be overcome or so changed in character that it is difficult to culture them, and yet for inflammatory changes to persist for some time. The pus obtained from an infected gall-bladder, for instance, is sometimes sterile: sterile pyuria may in some cases be so explained. The group of cases of abacterial pyuria to which I wish to call attention form a definite clinical entity. Inflammatory changes occur in the bladder and sometimes the upper urinary tract, but no organism can be obtained from the urine, not even after guinea-pig inoculation. The disease is probably caused by a filterable virus. It is of great importance, as the diagnosis of urinary tuberculosis may be made and, when only one kidney pelvis is involved, nephrectomy carried out. Cure of these cases is readily brought about by a few small intravenous doses of an arsenobenzol preparation.

Case Report

An unmarried woman aged 50 was first seen in the urological clinic on May 5, 1939. For five years she had suffered from a burning pain across the lower abdomen and from great frequency of micturition. Urination occurred hourly during the day and about four times during the night. Scalding was present during micturition and there was severe terminal urethral pain. Sometimes this was excruciating. On two occasions haematuria had occurred and lasted a few days. She had seen numerous medical men and had had at least one complete urinary investigation. Almost every known form of medicinal treatment for cystitis had been tried without success.

Examination.—The patient was in good general condition. No abnormality could be found in the genito-urinary or other systems on complete clinical examination. Microscopical examination of the urine showed numerous pus cells. Cystoscopy was undertaken. A little difficulty was experienced in introducing the cystoscope as the urethra was very tight at the external meatus. The bladder showed scattered areas of erythema and swelling of the mucosa, which were most marked on the lateral walls and dome. The base was not particularly affected. Both ureteric orifices were normal and were seen to discharge clear urine. The bladder capacity was very much reduced, being only 150 c.cm. Bladder distension was carried out and the capacity increased to 200 c.cm. Numerous submucous haemorrhages were seen in the bladder after this, but no splitting of the mucosa occurred. The patient was seen again on May 19. She stated that she