A POSSIBLE PREDISPOSING CAUSE OF DIPHThERIA.

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ANY suggestion which may assist us in arriving at a correct conclusion as to the causation of diphtheria is worthy of consideration. I wish to make one, which medical officers of health may be able to follow, and may determine as to its value. It is made upon the hypothesis that diphtheria is dependent upon a germ of living matter which is capable of reproducing itself when it meets with a congenial soil.

The suggestion is, that the quantity of carbonic dioxide in the atmosphere should be noted in those localities in which diphtheria specially develops. The close analogy which exists between the disease in question and potato-blight leads me to conclude that the conditions which promote the one have also an influence upon the other, which requires wide-spread observation for its determination. There is a close analogy between dry-rot and potato-disease, which connects the three classes of disease into one genus. Circumstances which are common to one may be common to the other, and those things which increase the productive power of the one have a similar effect upon the other, and *vice versa*. Thus, a germ of the fungus called *merulius lacrymans*, in contact with immature wood, in a position in which there is a want of ventilation and where some moisture is present, very soon produces its effect and sets up dry-rot in the ligneous tissue. But an excess of carbonic dioxide is required to promote the change in the albuminous matter of the wood: this excess is provided by ordinary oxidising processes in a badly ventilated structure. The fungus then decomposes the wood into carbonic dioxide and water. Thus are produced the two elements which are required to continue the mischief, and there is a rapid destruction of the building.

So also with potato-blight: I have found an excess of carbonic dioxide in the air obtained from fields in which potato-blight has been manifest; especially in that obtained from beneath the haulms of the plant. Germs of *botrytis infestans*, having been scattered over the haulms of potato, were found to propagate rapidly in those positions in which there was a want of ventilation. There is an acid atmosphere; if there be also excess of changing albuminous matter, the disease spreads rapidly. The first germs of the fungus vegetate in the stomata of the plant. The mycelium shoots downwards, takes up the oxygen which has been set free by the growth of the plant, prevents the incoming of carbonic dioxide at the stoma of the plant, and actually discharges into the air that which is life to the plant itself, and which is wanted below. Thus, a starving process is set up, and gangrene is produced. The plant is suffocated, so to speak, and the crop blighted. If there be not growth enough to cause this result immediately, or if some change, such as bright sunshine and a fresh wind, arrests the disease by dispersing the carbonic dioxide, the mycelium grows only in the juices of the plant. It in time reaches the tubes, produces resting spores in it, and ultimately destroys the potato itself.

In the case of diphtheria there is an opposite effect, but tending to the same end. The germ which sets up the disease finds its habitat in the throat. It may be that suffocation may arise in the early stages, the influx of oxygen into the blood being prevented at the point of inlet; but, should the production of morbid matter not be sufficient to lead to this result, the mycelium, in the form of the minutest possible granules, enters the blood, and, seizing upon the oxygen which the corpuscles already contain, interferes with their power to absorb carbonic dioxide from the tissues of the body, and brings about those changes which lead to death. The qualities of the atmosphere are altered in the throat; the conditions of the atmosphere of the blood itself are altered; and, if these changes go on beyond a certain percentage, there is but one result. The indications are to use means for the rapid removal of carbonic dioxide from the air, to decrease the power of development in the germs themselves, and to enable the patient to tide over the results of the disease.

As far as my experience goes, sulphurous acid is the most efficient remedy both locally and generally: it fulfils all the indications required; and with warmth, fresh air, and simple food, we have the best means for preventing the spread of the disease from the patient to the attendants. I am also accustomed to recommend that creasote be freely used about the house. I believe the inmates of gas-works have hitherto escaped the ravages of this disease. The germs do not grow freely in a creasote atmosphere.

The points for observation are: as to the presence of an excess of carbonic dioxide in the atmosphere in those positions, and at those times, when there is also present excess of changing albuminous matter. The altera-

tion from three hundred parts to six hundred parts in a million may be quite sufficient to determine the difference between an aborted germ of disease and a germ capable of development. If, therefore, a family be living in an atmosphere in which the quantity of carbonic dioxide is abnormally high, they are providing in themselves a manure-bed in which the disease may more easily grow than it would if the conditions were not present. This appears to be one of the reasons why the disease spreads so easily in schools, and why a foul atmosphere tends to its increase when specific morbid matter is present in a particular place. Ventilation, warmth, simple food, sulphurous acid, and creasote are the remedies for the disease, as well as the best means for preventing its extension. I would suggest also that the underground atmosphere should be tested, and also the quantity of gases contained in the water which the victims drink. Water deprived of its natural oxygen, and with an excess of carbonic dioxide, is in a good condition to assist in the diffusion of diphtheria, as of all other infectious diseases:

CLINICAL ACCOUNT OF A CASE OF SARCOMA OF THE FEMUR, FOR WHICH THE LIMB WAS REMOVED AT THE HIP-JOINT.

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DISARTICULATION at the hip-joint is an operation of great magnitude, and comparatively infrequent; but, besides, there are in the following case other features which may be interesting.

A. B., a young fellow twenty years of age, had enjoyed perfect health until four months previous to admission under my care into St. Thomas's Hospital on October 28th, 1878. He had never had a day's sickness previously. At this period, he first began to experience pain in his left thigh, which came on without antecedent injury or known cause of any kind whatsoever. He never had suffered from any venereal disease. The pain continued very severe, and a month after its first onset the thigh was noticed to be swollen. The swelling continued to increase rapidly, and was accompanied by severe pain, fever, and sleeplessness until admission.

There is no history of cancer in the family, nor of syphilis. The family history on the father's side is a consumptive one. The lad's paternal aunt, uncle, and grandmother died of phthisis. The father and mother are quite healthy. The boy is the third child, the eldest being alive and well; the second died at one month old of "fits".

On admission, the lad was much emaciated; his expression haggard and anxious from continual suffering day and night. The morning temperature was 100 deg. or 101 deg. Fahr.; the evening temperature a degree or two higher; he sweated profusely; his eyes were glistening, and features sunken. The rapid emaciation, the constantly high temperature, with regular evening rise, and the sweating at night resembled, and in fact constituted, a hectic condition. The temperature-chart (see next page) shows the evening increment occurring every night antecedent to the operation.

The whole thigh, from within two inches of its lower extremity quite up to the lesser trochanter, was occupied by an extremely elastic, smooth, fusiform, or cylindriciform swelling, over which the skin was pale and tense, but not adherent, and showed enlarged superficial veins. There was considerable synovial effusion into the knee-joint. Eight inches below the iliac spine, the sound limb measured only fourteen inches, the diseased nineteen inches and a half. The surface of the diseased limb felt much warmer than the opposite; but a thermometer for the purpose of ascertaining the exact difference was not at the time available. The elasticity was so marked as to suggest fluctuation very closely; in fact, as it afterwards proved, the tumour was so soft that a deceptive feeling of fluctuation was easily accounted for by the semi-fluid vascular character of the growth. Two exploratory punctures were made at different places, giving issue only to blood, which in one case came *per saltum*. No lymphatic glands were enlarged.

The close resemblance these symptoms in their entirety present to an acute inflammation appears to me very interesting. How similar in many ways are they, for instance, to an acute osteitis or osteomyelitis, with necrosis of the femur.

Very similar general symptoms would thus sometimes appear to arise from an excessive production of cells in the form of a tumour, and cells in the shape of an abscess. We have fever, and hectic temperatures, with rapid emaciation and profuse sweating in both instances. There were chilly fits, but nothing like marked rigor in A. B.'s case. But the local symptoms of pain, increased heat, pseudo-fluctuation, deep-seated swelling connected evidently with the femur, introduced a sufficient element of doubt to cause me to make a deep incision through the growth after the

patient had been placed on the operating table before proceeding to disarticulate. Cases of necrosis have been several times mistaken for malignant disease, and the limb amputated in error.

The diagnosis was that the tumour was sarcomatous in character, probably originating in connection with the periosteum, and of the round-celled type.

Some idea of the rapidity of growth may be formed by the circumference of the thigh becoming increased one inch during the eight days the patient was in hospital before the operation, an interval necessary to obtain the consent of the patient and his friends. The boy himself willingly agreed, so severe were his sufferings.

I removed the limb at the hip-joint on November 6th, 1878. Some points connected with the operation are of interest. As I believe in this operation rapidity of completion to be of essential importance, I decided to transect the limb in the usual way in making the anterior flap, although this involved slicing off the upper part of the growth; but there was no trouble subsequently in dissecting out the portion left behind and in giving it a wide berth, just as in removing a cancerous growth elsewhere.

When the anterior flap, which was necessarily somewhat short, had been made and the assistant in charge had seized the femoral vessels, Mr. Pitts began digital compression of the aorta, which was so absolutely efficient that no avoidable blood was lost; some dripped away, an ounce perhaps, from the divided veins, but not an artery, large or small, was for a moment out of control.

The limb being depressed and rotated outwards, the knife drawn across the capsule caused the head to start out of the socket; it was then grasped with the left hand, and the muscles attached to the trochanters divided. The operation was completed by dividing the tissues on the back of the limb, from without inwards, by a sweep of the knife carried obliquely downwards, a better method than by transfixing and cutting outwards.

During the disarticulation, the femur broke in two. All control over the motions to be given to the joint was, therefore, lost, and some little delay was inevitable; but the dismemberment was completed in forty-three seconds, as a bystander afterwards told me.

The vessels in the posterior flap were quickly secured, and then those in the anterior. Notwithstanding that practically almost no blood was lost, profound shock of an alarming character occurred on the table, the pulse disappeared, the breathing became imperceptible, and the surface cold and clammy. In a minute or so, this condition was partially recovered from.

After every bleeding point had been secured and the surface sponged with strong spirit, which is an excellent styptic and antiseptic, the wound was brought together with catgut stitches, drains were inserted, and aseptic dressings applied. The operation was performed under the spray.

The history of the subsequent recovery is short. There was no reactionary fever or hemorrhage, and practically no suppuration throughout. The wound united immediately, save where the drains emerged; these, large at first, were gradually diminished in size and length.

On November 22nd, sixteen days after the operation, the boy was able to be up and about, and was looking comparatively fat and well, while the wound appeared soundly healed, with the exception of a small sinus in the centre leading towards the acetabulum.

Almost immediately after the operation, the patient experienced relief. The very next day he looked happy and at ease, and soon lost all trace of the anxious pained expression he had previously shown. The rapidity of this change was remarkable, and he appeared daily to gain in flesh and strength. In a fortnight, he was able to be up in a chair; and on December 4th, or in a little over three weeks, to get about on crutches.

The tumour, on examination, proved to be connected with the periosteum, and to have pushed the muscles of the limb before it. The bone was infiltrated. The naked-eye appearances, on section, were those of medullary cancer. Under the microscope, round cells predominated, in the softer portions of the growth especially. In the firmer portions were many spindle-cells. The temperature-curve shows the influence of a rapidly growing tumour, and the fever it produces. There was no suppuration, but the temperature-chart is one characteristic of suppuration and hectic, as are the other associated symptoms. Similar increase of temperature may sometimes be found in a rapidly developing fungous synovitis antecedent to suppuration. The pathological distinction between soft granulation-tissue and fluid pus is a very fine drawn one. In the present case, we find rapid production of round cells in a soft sarcomatous tumour, inducing a state of fever and hectic quite similar to that caused by a severe suppuration.

The points of interest in the case are the hectic fever, dependent on the rapidly growing tumour, its remarkably rapid subsidence and total disappearance shortly after amputation, without either intercurrent wound, fever, or suppuration. The rapid convalescence and recovery were mainly or entirely due to the aseptic condition of the wound, which was so thoroughly provided for that, even during the action of the bowels, the wound was uncovered and the spray employed, lest the internal angle of the wound, which was about one inch removed from the anus, might become infected. Gauze dressing was employed during nineteen days; the strict antiseptic treatment was then left off, and boracic lint applied to the still unclosed sinus.

The employment of digital pressure is another point of some importance. In thin subjects, and during complete narcosis, it is, I consider, preferable to other methods. The aorta can be compressed in this way with the employment of no great force. To obviate some of the fatigue experienced, a weight may be superimposed on the hands of the compressing assistant. The compression need not be commenced until the tissues behind require division.

The loss of blood in this case was quite trifling, and came entirely from veins; yet the shock was severe, proving that shock after amputation at the hip-joint does not always depend, as Langenbeck affirms it

does, upon loss of blood, although this is certainly one important factor in it.

As the blood-vessels must be secured with all possible promptitude, torsion of the arteries is scarcely, I think, applicable, as it requires more time than the ligature. It is better to apply forceps in quick succession to all bleeding points, and afterwards ligature them. I tied the femoral artery and vein with silk, and the other vessels with catgut, and cut the ends off short. All bleeding veins were tied. It saves loss of blood at the time of operation, and diminishes the chance of subsequent oozing of blood into the cavity of the stump, and is in no respect hurtful in itself.

The catgut sutures, inserted very deeply into the flaps to bring their surfaces well into contact, required no subsequent extraction. The external portions, with the knot, were dried up, and were picked off the surface in three to four days. The deep loops were no more seen; there was not a trace of inflammation or irritation around the points of emergence of the sutures. The drawing accurately represents the form and condition of the stump eight weeks after the operation.

The operation, severe though it be, was justified by the relief from pain which the patient has received, although the probability of a speedy return of the disease in some internal organ or part is only too likely. No clue is given by this case as to the possible origin of these deadly growths. This young man had been, to all appearance, thoroughly healthy himself, and his father and mother were the same. There was not even an injury which might be alleged as an exciting cause. The supposed obscure connection or interdependence between sarcoma and syphilis, or tubercle, has yet to be proved.

CHRISTMAS AT DAVOS PLATZ.

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THE treatment of certain forms of pulmonary consumption by a winter residence in high altitudes having become more and more common among physicians, the results are discussed not only by medical men, but by the public, who grasp eagerly at any novel idea which holds out the prospect of a cure for this disease.

Among the mountain winter-stations of Europe, Davos Platz, in the Grisons, bids fair to become the most popular, as the influx of visitors

from many nations yearly increases, having doubled since last winter, and as accommodation is being now prepared to meet, as far as possible, the requirements of the future; therefore, a few impressions, noted on the spot, may be of interest to the readers of the BRITISH MEDICAL JOURNAL.

My objects in visiting Davos were—firstly, to realise the exact conditions of life in this high altitude in winter; secondly, to ascertain the effects of the climate on patients whom I have sent there.

After a journey of twenty-two hours from Paris, we reached Landquart, and the next morning, December 19th, we set out, in a covered sleigh, during a snowstorm; ascending the Prättigau valley, all smiling in summer, but now snow-laden and bristling with icicles, we reached Davos in seven hours and a half. There we were well lodged and warmed, but found that the weather had been miserable during the past month, and that, owing to the absence of sunshine and prevalence of wind, invalids have been much confined to the house.

Next morning, the snowstorm was over, the sun shone out in all its glory, and the broad valley, in its winter garb, looked far more beautiful than I had ever seen it in summer; the near mountains, which then are not remarkable for beauty of outline, now standing forth in bold grandeur, the pine woods and the dark peaks of the Schwartzhorn and Tinschhorn relieving the dazzling whiteness of the scene.

It being a "Sitztag", numbers of invalids were sitting out, well wrapped up, and armed with blue spectacles, in the open balconies facing south, to enjoy the warmth; whilst others, more robust, were taking their six-mile walks, or skating on the rink, or else "tobogganing", in the Canadian fashion, down the snow-slopes. Ascending a hill on one side of the valley, I soon found it hot enough to be glad to rest on a seat; and, as far as my sensations were concerned, I could have dispensed with a greatcoat. The radiation-thermometer (black bulb *in vacuo*) indicated 134 deg. Fahr., though the maximum of the ordinary thermometer in the shade was 21 deg. Fahr., the minimum that night being as low as -4 deg. Fahr.

The snow does not appear to melt much under the sun's rays, and is more powdery ("salzig") than in England; it shakes easily off one's clothes, and leaves no moisture behind. As the sun sinks, the scene assumes that beautiful succession of tints familiar to Alpine climbers—golden and pink and purple, and lastly cold grey; the twilight, morning and evening, being incredibly long. In fact, the phenomena witnessed in summer on the glaciers are seen in winter throughout the whole of the high valley.

From my friend Mr. Gunnery's excellent observations, I find that in the month of November the maximum in the shade varied from 26 deg. Fahr. to 45 deg. Fahr.; the minimum from 37.5 Fahr. to 8 deg. Fahr.; whilst the radiation-thermometer gave, according as the sun was visible or not, from 44 deg. Fahr. to 157 deg. Fahr. The barometer readings were between 24.40 and 25 inches—figures testifying to the high altitude, which is 5,200 feet above the sea-level. The hygrometrical observations show a difference of between two to three degrees between the bulbs. On November 25th, the "Föhn" (south wind) blew, and a thaw commenced, lasting three days, to the great discomfort of invalids; such an event, during the six winter months, being almost unprecedented. The winter has as yet been unusually severe, owing to absence of sunshine, which is the one heating influence of Davos. The hotels are well built, either of stone or of thick wood, are provided with double windows, and the rooms often wainscoted; they are warmed either by steam or hot-water pipes, or by ordinary German stoves, by means of which a sufficiently high temperature is maintained night and day.

Of the 650 visitors, there are 180 English, of whom about one-half are invalids. Most of these are doing fairly well; but there are a certain number of advanced cases who have come here, as a rule, contrary to all medical advice, and should never have left their homes.

Hearing that several deaths had occurred, I obtained a list from the official registrar of all which had happened since August 1st, 1878. They were 15 in all, including 4 English and Americans; of whom one died two days after arrival, and one one day. This does not include one or two cases who died after leaving Davos.

Though there is much grumbling at both weather and food, the mass of the patients seem to be doing well; and some of those I examined with Dr. Raedi, during my four days' stay, surprised me by their rapid improvement during two or three months' residence. Without going into particulars, I may state that I noted marked increase of appetite and gain of weight, with augmentation of muscular strength. The pulse is somewhat quickened and the respirations slightly increased; but I did not notice any marked expansion of the thorax, which has been observed by some authors. The physical signs in both first and third stage cases of phthisis showed a remarkable diminution of dullness, indicating either the development of emphysema or absorption of pneumonic products. Contraction of cavities appears to proceed somewhat rapidly