ON THE ELIMINATION AND ASSIMILATION OF MORBID POISONS.

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THE distinguished author of the Address in Medicine recently delivered at Oxford, argues that recovery and subsequent immunity from such diseases as small-pox "are produced by a process of impregnation and assimilation, and not, as was early believed, and is still by some maintained, of elimination." Dr. Gull goes on to say that "the old theory of depuration, though true of gross chemical poisons, as lead, or mercury, or arsenic, appears to have no application to those operations which take place in the body in contagious diseases, as the effect of organic poisons." The question which is thus raised is one of considerable scientific interest and practical importance. I have been at some pains to arrive at Dr. Gull's meaning; and, so far as I can understand him, I find it impossible to reconcile his doctrine with some of the well-known facts of contagious diseases. Every pathologist will admit that in contagious diseases there is "impregnation" of the system by a poison; but what is meant by "assimilation"? Surely there is an entire absence of proof that morbid poisons are assimilated into the substance of the body as food is assimilated; and yet this appears to be the sense in which Dr. Gull employs the term assimilation with reference to these poisons. Without doubt, there is a process of assimilation in contagious diseases; but, so far from the organism assimilating the morbid poison, the exact converse occurs: the morbid poison assimilates the fluids and tissues of the body, and the result is a millionfold multiplication of the original poison-germ. What, then, becomes of these poisonous materials? That they are ever appropriated to the use of the body by a process of assimilation, is not only unproved, but in a high degree improbable. That they are partly decomposed in the system, and then ejected by various channels, is likely; but that, in such a disease as small-pox, they are abundantly thrown off into the surrounding air, is absolutely certain. The whole doctrine of infection is based upon the proposition that poisonous emanations from the sick may enter the bodies of the healthy, and there reproduce the morbid processes to which they owe their own existence. Not only does a morbid poison assimilate the materials of the living body, but an individual sick of an infectious disease makes others as sick as himself; he assimilates his friends and attendants. Our ignorance of the chemistry of morbid poisons does not render them the less veritable "chemical poisons". The every-day practice of disinfection in such diseases as cholera and scarlatina accords with the indisputable fact that a material virus is thrown off from the system. If the doctrine of the natural elimination of morbid poisons is to be rejected, the doctrine of infection and the practice of disinfection must also be given up, as unmeaning and useless, these corollaries being necessary correlatives of the other.

The fact that the organism is not restored to its former condition after such a disease as small-pox, so that, as a rule, it is insusceptible of a recurrence of the same disease, is rather adverse to than in favour of this new doctrine of assimilation. The body is *unlike* what it was before; it has been assimilated; and the non-recurrence of such diseases is more in accordance with the hypothesis of Mr. Simon and Mr. Paget, that certain ingredients of the body are destroyed by each specific morbid poison, and that these ingredients not being reproduced, that particular poison finds henceforth no materials upon which its morbid agency can work. Not only the skin, but the entire organism, is, as it were, permanently scarred by the operation of the small-pox poison.

I entirely agree with Dr. Gull, that "the object of medicine must rather be to limit the violence of attendant symptoms, than, with our present knowledge of therapeutics, to aim at arresting or neutralising their specific processes." It is questionable whether vaccination can with strict propriety be called a "remedy" for small-pox. I should consider it rather as a means of prevention, or of exciting a mild and modified form of the disease. Dr. Gull goes on to say: "Yet, notwithstanding this teaching, pathology still persists in looking in another direction; and therapeutics are governed by the idea that disease is an entity which must be combated and cast out." Now here I venture to suggest, that the idea of a disease is confounded with the idea of a morbid cause. My idea of small-pox is that of an individual suffering from that disease; and, if I found such a patient in one of my wards, my belief in the doctrine of the elimination of morbid poisons would induce me to "cast him out" of the ward before he had infected the other inmates. Then, in treat-

ing the sufferer from small-pox, I should act upon the idea that the small-pox virus is as veritable an "entity" as the ovum of a tape-worm; and, believing that the natural process of cure consists in casting out the poison and its products, I should endeavour to favour that process by a free current of fresh air to carry away the poisonous exhalations as rapidly as they are formed, and thus to prevent their re-entrance into the system either through the air-passages or by other channels. Again, in treating choleraic disease, theory suggests, and practical experience confirms, the theory that the foetid morbid secretions should not be retained within the alimentary canal, but rather permitted, nay, even assisted, to escape. One of the strongest theoretical arguments against the use of repressive means in the treatment of the contagious diseases is derived from the fact that these morbid poisons, unlike inorganic poisons, are rapidly self-multiplying; so that their forcible retention within the body increases their destructive agency. The mischievous consequences of driving in the rash of scarlatina are too well known to require even a passing notice. I lately saw rapid death follow the repression of the variolous eruption by a prolonged application of a cold wet sheet to the surface. In how many instances the analogous practice of arresting choleraic discharges by a large dose of opium has been attended with equally fatal results, it is painful to contemplate.

To sum up, then; the doctrine of the elimination of morbid poisons is based upon three classes of facts.

1. There are thrown off from the bodies of those who are suffering from infectious diseases poisonous materials, which have the power of imparting the same disease to others.

2. The processes by which these poisonous materials are thrown off from the bodies of the sick, are essential for the recovery of health, and an arrest of those processes is often followed by serious, and even fatal, results. In other words, while the poison escaping is destructive to others, the poison retained is destructive to the patient himself.

3. The most successful methods of treatment are such as rather assist than hinder those natural eliminative processes, which, being constant, are obviously an essential part of the cure. So that, to repeat the words of Dr. Gull, "the object of medicine should rather be to limit the violence of attendant symptoms than to aim at arresting or neutralising their specific processes."

ON SUN-FEVER:

OR DISTURBANCE OF THE CEREBRO-SPINAL FUNCTIONS
BY EXCESSIVE HEAT.

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EXCEPTIONAL seasons are frequently accompanied by exceptional pathological phenomena. One year we have cholera from some occult or unexplained peculiarity of season, coupled with a *virus morbi*; another, as the present, sun-stroke, or *sun-fever*, from the more simple cause of excessive solar heat and light. But the morbid results, interesting as they are at the moment, are soon forgotten in the changes of season and lapse of time; and therefore it is well that we should attempt to fix such phenomena as may be interesting in a practical point of view whilst they are still fresh in our memories. For this reason I make no apology for offering some notes from my own experience, supplementary in some sense in kind, as well as in number, to those of Dr. Bullar in the JOURNAL for August 22nd.

All who have watched the morbid effects of the late excessive heat will have perceived that those effects vary, from such slight disturbance of the functions of the brain or heart as often results from mere muscular fatigue, through all stages of severity up to those terrible cases of heat-apoplexy which we find recorded in the works of our Indian surgeons.

The following cases, selected from such as have come under my own notice this season, are intended to show that considerable variety may be looked for amongst cases of what may be called the minor sort of sun-stroke. They will be found to differ materially from those related by Dr. Bullar; and, of course, still more from the severe disease described as heat-apnoea by Dr. George Johnson in the JOURNAL for August 1st. It is from neglecting to estimate sufficiently this variation in the phenomena resulting from insolation, that so many errors are made in the diagnosis of sun-stroke.

Amid this variety of morbid results arising from the same cause, two features appear to stand out so prominently from the rest, as to entitle them to be looked upon almost as pathognomonic of a disease which may without great impropriety, I think, be denominated *sun-fever*. These features are both of a febrile nature, being a disturbance, first, of the cerebro-spinal, and, secondly, of the circulating function. All the

derangements of other functions which accompany these appear to be dependent upon, or, at least, consecutive to, the principal abnormalities; and vary, as usual, in accordance with the idiosyncrasy of the individual. Thus, in one case, we find the heart's action depressed, with feeble pulse, cold, pallid skin, chills, perhaps rigors, giddiness, sickness, or nausea. To this condition there sometimes succeeds fever, manifested by pain in the head, hurried respiration, hot dry skin, sleeplessness, delirium, and great muscular debility. These latter symptoms are often interrupted, however, by semi-syncope, with great anxiety, and a feeling of impending death. The next case may be ushered in by excessive pain in the vertex and back of the neck, hurried respiration, bounding pulse, hot skin, and excessive thirst, to be followed by wild delirium, dry tongue, and all the phenomena of a sharp attack of fever. In this case, the debility, muscular and general, *succeeds*, whilst in the former it *precedes* the reactionary fever.

CASE I.—A stonemason, a strong muscular man, working at a short distance from the hospital one hot day early in the season, was brought in in a state of partial collapse, the result of sudden sun-stroke whilst at work. He stated that he had suffered from the heat for the previous two or three days. Having recovered from the collapsed condition, he exhibited, at the visit next day, the following state: considerable dulness of apprehension, loss of memory, hesitation of speech, with defective sensation and motion over the whole of the body. The skin was cool and had been so all along; the pulse slow and small; there were sleeplessness and anorexia, whilst the tongue was clean, with absence of nausea. The cold shower-bath was prescribed, with mild aperients, nourishing diet, and afterwards quinine. Under this plan he slowly improved, but was unable to leave the hospital on account of the defective sensory and motor power of the limbs. Faradisation slowly restored the lost power of the nerves, and after nearly three months he left the hospital pretty well.

Here the febrile symptoms were never developed at all. The nervous centres appear to have received too great a shock and interruption to their nutrition to be able to react after the manner of fever.

CASE II.—On one of the hottest days of July last I saw, with a young practitioner in Herefordshire, Mr. O., a slim youth of 18, the son of a farmer. Having taken the place of one of the labourers for an hour or two on the top of a hay-stack in the broiling sun, he was brought down in a state bordering on collapse. They gave him a quantity of cold water and cider to drink, to the former of which the parents attributed their son's subsequent illness. In the evening, after vomiting, smart fever came on; some rigors, preceded by pain in the head and hot skin. The next day the vomiting continued; the thirst was excessive; he had pain down the spine and in all the muscles, and at night delirium. The pulse varied from 98 to 120, or more. The disease was now considered to be gastric fever, the results of the administration of the cold water during the state of collapse. I saw him on the fifth day. The pulse was then 110, somewhat irregular in strength, and there was an occasional tendency to syncope, which led to my being called in. The delirium had been exceedingly violent during the night. Notwithstanding this I found the head cool, the pupils unaffected, and the patient capable of describing his symptoms. The skin was dry, but not preternaturally hot. I ordered ice to be kept to the head, in a flannel bag to mitigate its severity, ice to be slowly swallowed, concentrated essence of beef with half-an-ounce of brandy to be given every three hours, and the surface to be sponged with tepid water. This youth became rapidly convalescent, and the next week was well, although very weak.

In this case I looked upon the fever, with its delirium, etc., as mere phantoms; a mockery of that displayed by inflammation of the meninges; and therefore did not hesitate to stimulate freely, and to give a decidedly favourable prognosis.

CASE III.—A medical friend, of middle age, and somewhat delicate constitution, never able to bear much muscular exertion during great heat, had been much distressed by the excessive heat of the latter part of July, the symptoms being burning heat of body, scarcely relieved by repeated cold sponging, restlessness, unsound sleep, and inability to read long together, with a peculiar unstable feeling in the brain which rendered much mental exertion distressing.

The 23rd July was a cold, bleak day, interpolated between excessively hot ones before and after it. On the evening of this day he felt inclined to shiver, and the skin ceased to act. On the following day, he imprudently took a Turkish bath with the intention of restoring the cutaneous secretion, but without any effect save that of exhausting the heart and increasing the illness. Smart fever came on in the evening, without previous rigors; the respiration being exceedingly hurried and laboured, and the skin burning hot. There were intense headache, great thirst, and frequent inclination to micturate. The rapidity of respiration bore no normal relation to that of the pulse, it being 48 or 50; whilst the pulse, habitually about 60, was increased to 75. This

proved to the patient that he was suffering from congestion of the lungs. Saline aperients were administered, ice was constantly applied to the head, and small pieces of it were swallowed with acidulated drinks in large quantity. The appetite did not fail, and therefore food was administered frequently; broth, pudding, etc., with small quantities of brandy about three or four times in the twenty-four hours. The severe febrile symptoms, violent pain in the head, etc., lasted for three days, when the skin began to act gently for the first time, with immediate relief to the brain and lungs. During this time the irritation of the neck of the bladder brought on an attack of most violent spasmodic pain there, and along the urethra, every attempt at micturition causing the most excruciating suffering. As the patient had suffered from inflammation of the neck of the bladder and vesical tenesmus on previous occasions, he was unwilling to take any stimulants, as they invariably caused, even in the smallest quantity, great aggravation of the suffering; but, on this occasion, to his great surprise, he found that, in place of instant aggravation of the tenesmus, as formerly, there was nothing of the kind now, but rather a soothing effect on the parts. Much muscular debility succeeded the subsidence of the febrile symptoms, which were finally dissipated under the inspiring influence of the Oxford meeting.

In this case the patient was quite unaware at first how much his symptoms depended upon previous exhaustion of the nervous system, and of the heart by the previous hot weather, or he would not have further weakened the latter organ by such a demand upon it as the Turkish bath was sure to make. The vesical symptoms were peculiar. As no cause was known for their appearance at this time, they were at first attributed to the acidulous drinks which were partaken of rather freely; whilst, doubtless, the parts affected merely participated in the same venous congestion which gave rise to the head-symptoms, and to the hurried and laboured respiration.

CASE IV.—A farmer, aged 48, of muscular and energetic habit, called upon me last week to complain, or rather his wife complained for him, of weariness, pain in back of head or down the spine, inability to sleep after two in the morning, and great and ceaseless anxiety. Pulse quiet; skin rather hot. He had felt the heat, he said, a good deal, having been exposed to it every day, and all day long. His appetite failed, but there was no thirst. The vessels on the cheeks showed the red blood in them; and altogether the man did not appear to be very ill, although he was not the man, he said, to go to a doctor "for nothing." For the sleeplessness I ordered fifteen grains of bromide of potassium, as he declined to take any narcotic; and for the loss of appetite hydrochloric and phosphoric acids, with nux vomica. He was to come again in a week. On the third day he called to say that the first dose of the salt (he had it in the crystal to show him there was no opium) had acted like a charm; he slept well all night, and was now "as good as well." One might suppose that the salt had acted upon the imagination alone here, had it not been that I told him not to expect sleep from it, but only a soothing effect. If not a narcotic, certainly this curious salt does prove an excellent hypnotic in cases of restlessness and anxiety. I have given it every night for six months with the best effects in this respect, and without its being followed by unpleasant symptoms of any kind.

The moral to be drawn from such cases as the above, I would suggest, is, that they ought to be treated chiefly on their merits, only bearing in mind that the cause, in all cases, is a depressing one; and that, whatever may be the intercurrent or consecutive symptoms, what we have to look to is the debilitated condition of the heart, and the consequent congested state of the lungs, caused by the more or less sudden withdrawal of nutrition from the nervous centres, the over-heated blood proving, seemingly, antagonistic to normal nutritive action.

It is only by experience that we shall learn the real value of great cold, as ice, applied to the head, or to the stomach by swallowing, in these cases. *A priori*, viewing the collapsed condition in cases of sun-stroke, we should be led to fear the effects of sudden cold applied to the sources of life. But, if our Indian brethren find it tolerated in the severe cases with which they are familiar, unquestionably we need not be afraid to use it in such milder cases as are met with in this climate. Certainly, the medical man whose case is related above (Case III) found the greatest relief from ice applied to the head for three days together (with the proper caution of placing flannel between it and the scalp), and using it largely with acidulated drinks. As regards the pathology of these cases, I cannot think that it tallies with that of heat-syncope, or "heat-apnoea," which, by the way, is only a symptom, although the severe cases referred to by Dr. G. Johnson may be of that character. I believe that it is the nervous centres whose function of generating normal nerve-force is interfered with; and, according as the blow is most felt by the cerebro-spinal centres, or by the great ganglia of the sympathetic, will be the direction in which the symptoms may be expected to develop themselves.