present in the blood, which so easily lends itself to the formation of acid compounds.

Clinical observation of the respirations in cases of disordered action of the heart does not favour the theory of acidosis due entirely to deficient lung ventilation. The respiratory centre and muscles come primarily under the influence of altered circulating fluids, their function is interfered with, and the increased contribution of hydrogen ions they make to the circulation is secondary.

We know from physiological and from clinical experience in different diseases that certain compounds stimulate one or other divisions of the autonomic nervous system. The case I review in this paper is one instance where the vagus is under such control. The rule, as we know, is for stimulation of the sympathetic. I only point out that such is the action of various abnormal circulating fluids.

In D.A.H. it is not only the respiratory and autonomic systems which are disturbed, but the changes in the function of the psychic, cardiac, locomotor, and other systems are so pronounced as to suggest the cases being grouped into psychic, neuro-muscular, cardiac, etc. Such abnormal intercellular phenomena are accompanied by a mechanism apart from the nervous system, and must result from the intermediary action of the circulating fluids acting either (*a*) directly, by bathing the cell in an abnormal chemical compound which may initiate a change in the chemical reaction of the cell itself, or possibly change the arrangements of the protoplasm and nucleus; (*b*) more indirectly, through the action of these fluids on the endothelium of the capillaries interfering with material exchanges between the blood and the interstitial plasma.

I have attempted to prove that it is in the body fluids we have the common factor of disordered action of the heart. The rôle of the autonomic system is that of the small child who starts the motor car and is unable to pull the levers of control. By means of its more or less continued stimulation, a vicious circle begins—(1) stimulated autonomic system; (2) altered body fluids; (3) altered function—in which all systems, including the autonomic system, take a part. Similar changes take place, we have seen, in the acute infections and other diseases, and are followed by similar symptoms; their importance in the history of D.A.H. being that once the vicious circle has been created, it is entered upon again more readily. The relation of single or repeated mental shocks depends on the degree of shock and the stability of the autonomic nervous system.

I have never seen a satisfactory explanation of the symptoms of D.A.H., but, having followed me so far, if you will understand the sense in which I use the word "exhaustion" as being synonymous with malnutrition of the cells owing to the chemical alteration of their necessary food, I will try and apply them to my solution of D.A.H.

Breathlessness, especially on exertion, is the most common symptom of this condition. If we were dealing with a normal respiratory centre and muscles, and with blood which was normal, except for the addition of hydrogen ions as a result of deficient lung ventilation, we would surely have such a response of the centre and of the muscles that any disturbance of the potential alkalinity of the blood would be corrected.

The arrangement, we have seen, is that the circulating blood has its alkaline balance disturbed, quite apart from the respiratory system, and that a further disturbance of this balance occurs as a result of deficient lung ventilation. The respiratory system in these cases cannot be judged by ordinary standards. The centre bathed by abnormal fluids, with function either inefficient or exaggerated, is on a different plane. The respiratory muscles have every evidence of exhaustion. We know that with increased hydrogen ion concentration the avidity with which the blood gives up its oxygen is accelerated, so that, considered clinically, it would appear that both the centre and the blood required to be further activated by carbon dioxide in order to obtain the necessary response for ordinary effort. This explanation does not pretend to be anything more than an attempt to correlate the clinical appearance of respiratory action with certain changes in the blood. I bring it forward with considerable trepidation, but with the certain feeling that an analogy does not exist between the experimental injection of lactic or other acids and the autogenous disturbance of circulating fluids such as we have present in these cases.

Precordial Pain.—Starling[10] has shown that the reserve power of the heart is enormous and is dependent almost entirely upon its nutrition. The cardiac pain, whether accompanied by hyperaesthesia or not, is merely the distress signal of an organ compelled to work in spite of a food supply, at least altered chemically. In Meakin's series of cases of hyperaesthesia[11] two cases with a known toxic factor support this—one an appendix case with an area of hyperaesthesia on the right abdomen, as well as a precordial area; and the second case, one of chronic dysentery with an area of hyperaesthesia on the left abdomen, as well as a precordial area. In both of these cases, with the cure of the primary condition and the disappearance of the toxin, not only the local but also the precordial hyperaesthesia disappeared.

Palpitation is the outcome of an overacting heart, or of extrasystole, and with the exhaustion, the vasomotor and other symptoms are explained by the changed character of the body fluids interfering with function.

This paper must not be considered as more than clinical, based on observation and on deductions which the writer hopes are within reason. It should direct attention to the importance of all debilitating factors in the life-history of the individual, which, although disappearing without trace, nevertheless have created a vicious circle which readily recurs, and under any stress will reappear and alter every function of the body, mental and physical.

The final solution of problems involving disordered functional correlations of a chemical or neuro-chemical nature must remain in the hands of the physiological chemists.

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INTRAVENOUS INJECTIONS OF ANTIMONIUM TARTARATUM IN BILHARZIOSIS.

BY

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SINCE May, 1917, we have been treating bilharziosis (rectal and vesical) at the Khartoum Civil Hospital by the intravenous injection of antimony tartrate, and I am convinced of its efficacy.

So far as our present knowledge goes—leaving out of consideration for the present antimony—there is no cure for bilharziosis excepting time, and there is no drug to which bilharziosis will directly respond even in the feeblest way. Symptoms may be alleviated, and even temporarily suspended, by rest in bed, by dieting, and by symptomatic treatment; but, after all is said and done, there is, so far as I know, no drug (again excepting antimony) which has the slightest direct effect on the career of the *Schistosomum haematobium* in the portal circulation and its tributaries.

The intravenous injection of antimony tartrate (details of which I have recorded elsewhere[1]) has a profound effect on the symptoms of bilharziosis. One may safely say that, so far as subjective and objective signs are concerned, a cure is effected; one cannot say at this present time that the cure is permanent (it certainly lasts for weeks and months). The permanency of the cure still remains to be probed.* The remedy, no doubt, must be administered with ordinary care, and with the judgement which obviously is due whenever a powerful and toxic drug is used, but it appears to me that antimony tartrate

* Cases so treated months ago are under observation, and will be reported on in due course.

is a specific in its action on *Schistosomum haematobium* as it is in its action on the Leishman-Donovan body (Leishmaniasis).

The following is an account of a case treated by Dr. Nicola Malouf, now practising in Khartoum, with his notes. It is interesting because not only does it in a short account give the typical course of the progress of vesical bilharziosis under treatment with antimony tartrate, but it shows that, with due care, the remedy may be administered without the necessity of the patient lying in bed for a month, or, in fact, without his having to go to bed at all. In point of fact the case was treated in the out-patient room of a private practice. The patient was detained for a short time after the injection at the surgery, and lay down on his bed for the rest of the day of injection at home. He went about his business in the interval as usual.

Abbashur Musa, a native of Wad Medani, 20 years old, a cultivator, visited Dongola in the years 1912–13, and returned with blood in his urine. His urine was nearly half blood and half urine at the time injections commenced; it was never clear. A sample was sent on August 13th, 1918, to the Wellcome Tropical Research Laboratories, Khartoum, and heavy infection with ova of *Schistosomum haematobium* reported. The patient had tried many medicines, especially extract of male fern, but without any effect whatever. He had had no previous disease, and complained of nothing except his urine and of some swelling and pain in the right testicle which he attributed to the same disease.

Method of Treatment.

A stock solution of tartar emetic, gr. 1 in each 20 minims of distilled water, was prepared, and each 20 minims of this was mixed with 30 minims of sterilized normal saline solution before injection. The antimony tartrate solution was always injected into the right median cephalic vein. The treatment was begun on August 15th, 1918.

Date.	Dose.	Untoward Action or Result.
1918.		
Aug. 15 ...	gr.½	*Nil.*
,, 17 ...	gr.1	*Nil.*
,, 19 ...	gr.1½	Cough moderate.
,, 21 ...	gr 2	Severe cough.
,, 23 ...	gr.2½	Severe cough.
,, 25 ...	gr.2½	Severe cough; patient stated urine clear for the first time in the last four years.
,, 27 ...	gr.2½	Severe cough, eyelids and face puffy, appetite lost, felt very weak, cold hands, pulse 100 and weak, temperature 98° F.
,, 30 ...	gr.2	Same symptoms but mild.
Sept. 3 ...	gr 2	Patient was given gr. ½ codeine phosphate thirty minutes before the injection; cough not so troublesome.
,, 11 ...	gr.2½	Cough very severe, puffiness of face and eyelids returned, colour of face ash-like, cold sweat.
,, 15 ...	gr.2	Codeine gr. ⅔, in three doses at half-hour intervals before injection; cough moderate, no other untoward action.
,, 20 ...	gr 2	Codeine as on previous occasion with same result. Patient wanted to stop treatment as he believed he was cured.
Oct. 1 ...	gr.2	No complaint of special interest.
,, 3 ...	gr.2	No complaint of special interest.
,, 7 ...	gr.2	No complaint of special interest.
,, 12 ...	gr.2	No complaint of special interest. The last injection.
Total ...	gr.31	

It will be seen (1) that for five years the patient had had haematuria, that his urine was never clear during four of these five years. (2) That after the fifth injection the blood in the urine disappeared and the patient stated that it was the first time for four years that his urine had been clear. (3) That after the twelfth dose the patient was convinced that he was cured; he may have been, but the course was continued by Dr. Malouf until he had given gr. 31, in fifteen doses varying from gr. ½ to gr. 2½, in fifty-six days. The urine, owing to the exigencies of private practice, was not tested every day.

There were two breaks in the course of the treatment. One of eight days and one of ten days. These lapses did not apparently make any difference to the final result, and it is interesting to note that the cause of the ten days' lapse was Spanish influenza, so that in a man with healthy organs, Spanish influenza complicating the course of injections of antimony tartrate need have no untoward result.

The cases treated at the Khartoum Civil Hospital have the urine microscoped every day. The urine of the case being reported here has been tested half a dozen times since the injections ceased; it contained nothing abnormal. I am quite aware that a sufficient interval has not elapsed in the present instance to make any statement regarding the *permanency* of the cure, but no drug which I know of has even the temporary effect on the subjective and objective symptoms of bilharziosis that antimony given as antimony tartrate has; this effect is certainly profound and striking.

In the only *post-mortem* examination I know of—in a case which had died during a course of treatment by antimony tartrate injections for bilharzia—I am informed that no worms were found in the portal circulation (the *post-mortem* examination was made a very few hours after death). This is an interesting and important statement and significant.

I have elsewhere[2] drawn attention to the care and judgement necessary in dealing with a disease by the use of a powerful remedy such as antimony tartrate. It should be remembered that it is a poison, that even small quantities have been known to cause death (gr. ½ in a child, gr. 2 in adult), to say nothing of the risk of chronic antimony poisoning, that the injection is made directly into the veins, and its use requires additional care by reason of this fact.

Intercurrent diseases of the heart, liver, kidneys, lungs, should be looked for, and the metabolic processes of the body so far as possible should be sound; if not normal, they are additional causes for circumspection.

I think gr. 30 should be considered for the present the maximum dose for an adult's course for bilharziosis, and, if more be required, a second course of injections should be administered after an interval of some weeks or months. It may be that, as more is done on this treatment, a much smaller dose will be found to be the required killing "charge." It may be, and very likely is, the case that some cases only require a comparatively small dose whilst others require a dose of gr. 30 or more, and that others again require several courses of gr. 30 to rid them of the bilharzia worms.

It is almost certain that tartar emetic will have a deleterious effect on organs and tissues when given recklessly, empirically, and without the sense of responsibility which is due to the act of injecting anything—however benign, however poisonous—into another human being's veins.

There are still sufficient empirics in the medical profession to damage again the reputation of tartar emetic (antimony) as a valuable remedy. Such a result would be a calamity now that it appears to be taking its proper place as one of the most powerful and useful germicidal agents we possess; and I think this note of warning is necessary, because it is in partially civilized countries where the diseases—leishmaniasis, sleeping sickness, and bilharziosis—which are amenable to treatment by antimony abound. There also the methods of the quack and charlatan flourish, encouraged by the ignorance and prejudice of the native races.* I beg to acknowledge with thanks the help I have received from Mr. J. R. Newlove in this work.

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FIBROMA OF THE TRACHEA.

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FIBROMATA of the trachea, though they occur second in frequency amongst all innocent tumours found in this region, are nevertheless, I think, of sufficient rarity to justify the publication of such a remarkable case as that about to be described.

StClair Thomson[1] states that fibromata of the tracheal lumen occur second in frequency to papillomata, but Sauer[2] has only been able to collect published records of

* In the tropics there is a diversity of medical talent, as one would expect from the diversity of the nationalities of the doctors. In the eyes of the tropical public doctors are all the same. They are medicine men, and there is nothing medical which is revealed to one and not the others. Most of the local doctors are altogether empirical in their ways of treatment, and the treatment of kala-azar in the Sudan (by antimony tartrate) has, no doubt, not come up to expectation in their hands. This is, however, no reflection on the efficacy of the treatment when carried out intelligently.