eruption was said to have faded away gradually, but the skin of the left palm remained thick, and showed a tendency to scale.

In the spring of 1915 the eruption gradually reappeared in a worse form on both hands. The patches were sharply defined, slightly elevated, thickened, and infiltrated. The dry, scaly, and imbricated papular eruption was growing peripherally. There was marked keratosis of the skin of the left palm. The scales were whitish and greyish. There were no vesicles or pustules. The dryness was very marked even in the fissures of the affected skin. There was no pain, itching, or other subjective symptom. Ointments, intestinal antiseptics, and aperients were given without any benefit. No arsenic was given. X rays were applied in September, 1915, with marked benefit. Four mild doses were given at weekly intervals. There was a retrogression of the eruption after the first application of the rays. The lesions yielded quickly to each exposure, and eventually disappeared after the fourth dose, but the skin remained somewhat thick and hard.

The eruption recurred in the spring of 1916. It came on gradually, as in the previous year, almost on the same sites, and was of the same character. Keratosis of the skin of the left palm was well marked. The patches gradually disappeared again after three small doses of x rays, given at weekly intervals in August, 1916. A week after the last treatment there was no trace of the eruption, and only a slight pigmentation was left, but the skin of the left hand was not quite soft and normal. Another mild dose of x rays was given about a month after the third dose. The condition of the skin improved after this, but it was not quite normal, and treatment was discontinued. No arsenic or internal medicine was given, nor was anything applied locally.

A similar recurrence of the eruption gradually set in in April, 1917, almost on the same sites, and of the same character. The patches on the right hand were larger and the keratosis of the skin of the left palm was more marked. No x rays were applied this time. On June 11th chlorine ionization was given to both the hands. Within a week the hyperaemia and scale formation became much less, and the skin was softer and more supple. Some of the fissures healed. The second treatment was given on June 17th. Within the next week all the fissures healed, the scaling was very slight and the skin was much softer. The third treatment was given on July 1st. Within a week the scaling entirely disappeared, and all inflammatory symptoms subsided. Healthy skin was forming in place of the portions that had peeled off. The skin of the left palm was nearly normal. By July 8th there was no trace of the eruption. No pigmentation occurred as under x-ray treatment. The skin of the left palm though quite soft was yet a bit thicker than normal. The fourth and last treatment was given on this date.

In this case the lesions were on the palms and back of the hands, which usually escape. There were no patches anywhere else. Keratosis of the skin of the left palm was not due to arsenic, as it was not taken at any time. Another unusual feature was the recurrence in warm weather. Usually the eruption improves markedly in warm weather and gets worse in cold. The beneficial effect of sunlight, the advantages of a permanent transfer to a warm climate, its less common occurrence in warm climates and in exposed parts, have been recognized, and point to seasonal influence as a powerful and important etiological factor.

Auto-intoxication due to poisons manufactured by the body as the result of defective metabolism, altered gland secretion, or absorption from the alimentary canal owing to defective digestive processes, appears to be the immediate and primary causative factor. The part played by the nervous system seems to be secondary, as does that of pathogenic organisms, to the toxæmia, which poisons and damages the epidermic cells and prepares the "soil" for successful parasitic invasion, as evidenced by the grafting of other lesions on patches of psoriasis.

Chlorine ionization is, I believe, more efficient than x rays. It is quick, and has the great advantage that the sittings can be continued as long as it is necessary without any ill effects whatever, whereas the application of x rays must necessarily be limited. The dose of x rays should be just sufficient to stimulate but not to injure or destroy the skin. Therefore x-ray treatment has to be stopped before the involution of the eruption in many cases.

In the local treatment of psoriasis and other diseases the electro-ionic method offers facilities which no other except x-ray treatment affords. It allows us to introduce into each cell, impermeable to most remedies, a whole series of ions and to obtain different actions to the desired degree and depth. Ointments, liniments, and lotions act only superficially, and only an infinitesimal fraction can penetrate even into the deeper strata of the epidermis. The skin and the surface of wounds are, with the ordinary means of application, impermeable to powerful alteratives, strong antiseptics and coagulators of albumin, which

electrolysis readily introduces to whatever depth one wishes, through the skin and deeper tissues to joints even, and in sufficient quantity to produce the desired effect of stimulation, paralysis of function, or death of tissues.

Local ionic treatment could, with advantage, replace general treatment in many conditions. Medicines introduced into the stomach or subcutaneously enter the circulation, are added to the ions of the organism, and are eliminated after transient action; whereas by electrolytic introduction the ions are substituted for the ions of the organism and are not introduced into the circulation, but into the plasma of the cells which retain the ions for a long time and ensure efficient and lasting action on the tissues, which, moreover, get flooded with blood determined to the part by the vasomotor paralysis induced over the whole surface of introduction, lasting for several days. This action could be kept up by weekly sittings.

In x rays we have a more powerful weapon, which must, however, be wielded with greater care. The action of x rays is doubtless purely local, but as to its precise character there is still much to be learnt. The rays modify the electrical equilibrium of the tissue molecules, bring about chemical changes in the cells, and affect the vascular system. In small doses x rays produce at first a passing active hyperaemia, and then a lasting passive hyperaemia, stimulating the nutrition of the tissues, and causing the absorption of inflammatory products. They restore healthy metabolism and exert an antitoxic effect. In large doses their action is destructive. This disintegrating action is usually limited to certain elements of the skin, and is to be carefully avoided, except in a few special cases.

No other treatment can compare with these two most valuable and powerful methods, properly applied, for efficiency, rapidity, perfection of results, and absence of pain, where local treatment is indicated in any morbid condition. Moreover, their application is clean, agreeable, convenient, and cheaper in the long run.

ACIDOSIS AS A POSSIBLE CAUSE OF CERTAIN SYMPTOMS IN DIPHThERIA.

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If severe cases of diphtheria do not receive antitoxin before the third or fourth day of disease death may occur on the fifth to seventh day from an overwhelming toxæmia with signs of heart failure. In a large number of late cases temporary improvement follows rapidly on administration of serum, the throat cleans, the patient is able to take a fair amount of food, and appears to be convalescent. About the tenth to twelfth day the complexion assumes a slightly dusky pallor, food is refused, and vomiting occurs. The vomit at first consists of food, but later becomes like coffee grounds. The patient vomits five or six times a day whether food or drink is given by the mouth or not. The heart's action becomes weaker and the pulse more feeble by slow degrees, until by the third day of vomiting the pulse is imperceptible at the wrist, the extremities become pale and cold, the urine is greatly diminished in quantity, the face assumes an earthy pallor, the liver may be enlarged, sometimes severe epigastric pain is present, occasionally, in older patients, a fear of impending death is present; the consciousness is maintained to the end, which is preceded by a short convulsion.

In nine years' experience in a large fever hospital I have never seen a case recover in which this condition is established, except one treated in the way to be described. These cases are described in the textbooks as suffering from late heart failure, but, from careful observation, the failure of heart, circulation, and kidneys appears to follow the onset of vomiting. The numerous cases which show feeble heart and circulation after diphtheria usually recover if vomiting is absent, except those which die from acute intoxication in the first few days.

All drugs have proved useless to check the vomiting. The administration of adrenalin, pituitrin, and salines by rectum or subcutaneously, and the stoppage of all food & &

mouth slightly prolongs life, but does not stop the vomiting nor preserve the patient.

As certain cases present some features resembling the symptoms described as acidosis due to delayed chloroform poisoning,¹ a trial of the effect of the administration of 30 to 35 grams of sodium bicarbonate a day in 2 per cent. solution, by rectum and subcutaneously, was made on a patient showing this condition. This patient stopped vomiting within twenty-four hours, and after a prolonged convalescence recovered. Encouraged by this result, a daily analysis was made of the total urine of seven of the more serious cases for evidence of acidosis. Examination of total acidity, total N, total NH_3N , relation of NH_3N to total N, the quantity of acetone and oxybutyric acid, was made daily. Of these cases, five recovered without vomiting, two died with vomiting symptoms. In these last two cases there is, unfortunately, a gap in the records between their first admission and the onset of vomiting. The first five cases excreted daily acetone varying from 0.040 gram to 0.622 gram, and oxybutyric acid from nil to 1.1 grams. $\frac{\text{NH}_3\text{N} \times 100}{\text{Total N}}$ varied from 7 to 15 per cent.

The acetone bodies diminished within three days after serum to a mere trace, and $\frac{\text{NH}_3\text{N} \times 100}{\text{Total N}}$ to below normal.

The disappearance of acetone bodies took place in spite of the fact that the patients were only having milk; and, in fact, the case showing the highest proportion of these bodies had been having a considerable amount of carbohydrate food in addition before admission, so that their presence was apparently not due to mere starvation. The complete figures for the two vomiting cases are given below.

CASE VI.—The patient, aged 6, was admitted on the third day of disease; antidiphtherial serum, 16,000 units, given. On the tenth day vomiting occurred five times. On the eleventh day the patient was given 36 grams of sodium bicarbonate; there was no vomiting. The following day 16 grams of sodium bicarbonate were given; no vomiting. Death took place on the fourteenth day.

Analysis.

Day of Disease.	Total Urine.	Acidity.*	Total Acetone.	Total Oxybutyric Acid.	Total N.	Total NH_3N .	$\frac{\text{NH}_3\text{N}}{\text{N}}$
3-4	c.cm. 526	60	gram 0.026	gram Nil	gram 2.2	gram 0.21	10%
10-11	250	11	0.028	Nil	2.15	0.01	0.5%
11-12	772	22	0.254	Trace	2.5	0.029	1.9%
12-13	630	22	0.283	Trace	2.7	0.052	2%

* Equivalent to c.cm. N/10 acid per 100 c.cm. urine.

CASE VII.—The patient, aged 7, was admitted on the fourth day of disease; the case was a severe one. Antidiphtherial serum, 20,000 units, was given. Vomiting occurred three times on the ninth day, and also on the tenth; on this day 22 grams of sodium bicarbonate were given. No vomiting took place on the eleventh day; a further dose of sodium bicarbonate, 36 grams, was administered. Death occurred on the thirteenth day.

Analysis.

Day of Disease.	Total Urine.	Acidity.	Total Acetone.	Total Oxybutyric Acid.	Total N.	Total NH_3N .	$\frac{\text{NH}_3\text{N}}{\text{N}}$
9-10	c.cm. 510	198	gram 0.51	gram 0.33	gram 3.2	gram 0.45	14%
10-11	360	37	0.41	0	3.3	0.21	7%
11-12	330	37	—	—	—	0.3	—

In Case VI acetone appeared to be washed out of the tissues by the increased urine. In Case VII this was not evident. From all these analyses there is no greater indication of acidosis than is present in many pyrexial conditions, except in the failure of a large amount of soda to render the urine alkaline. In fact, in Case VI the acidity was actually increased by 36 grams of soda. Cushny² notes that 12 to 15 grams is sufficient to render an adult's urine alkaline. It is probable that most of the soda is fixed by the proteins of the tissues. The small increase in acetone (from diacetic acid) only accounts for a negligible

amount. Considering that a diabetic may excrete up to 10 grams daily⁴ of acetone bodies without symptoms, these acids cannot account for the symptoms in diphtheria.

No lactic acid was found in the urine, and in Case VII the Cl as NaCl diminished from 4.5 grams to 2.05 grams between the tenth and eleventh days. The administration of the alkaline liquid rendered the patients oedematous, a condition not seen in those dying naturally with these symptoms, so apparently some of the fluid administered is poured out into the tissues. In each case the soda diminished or stopped the vomiting. The vomit remained as clear fluid and did not become like coffee grounds, and only contained 0.07 per cent. total acids (as HCl) to phenolphthalein.

If there is a real acidosis it might account for the symptoms, as Crile³ states that acidosis exhausts the adrenals, and the prostration, weakness of the circulation, and vomiting resemble the symptoms caused by adrenal failure in Addison's disease.

These investigations, extending over a year, are published with reluctance, as being very incomplete, but they cannot be completed as I am proceeding on military service, but on the original hypothesis prophylactic measures have been adopted which have given most encouraging results in the prevention of these symptoms. Every severe case coming under treatment late during the past eleven months has been treated at once with 10 to 15 grams of sodium bicarbonate a day for several days in divided doses by the mouth, in addition, of course, to full doses of antitoxin.

The number of cases admitted was 290; 52 were severe late cases (third day or after), and of these 11 died from all causes, including 5 within forty-eight hours of admission, and 3 from bronchopneumonia following laryngeal diphtheria; this leaves only 3 deaths from heart failure. Not one of the whole 290 cases had any vomiting, and many unexpected complete recoveries have taken place. The mixture given is—

Sodium bicarbonate	...	...	2 grams
Potassium bicarbonate	...	...	0.5 gram
Magnesium carbonate	...	...	0.5 "
Aq.	...	...	ad 30 c.cm.

Every four hours.

It appears to alter the toxic pallor to a more healthy tint, and increases the urinary secretion and diminishes the albuminuria.

Conclusions.

1. Some of the symptoms in vomiting cases of diphtheria may be due to a previous acidosis causing adrenal exhaustion.

2. These symptoms are not prevented by antitoxin if the patient does not receive it by the third or fourth day of disease.

3. The administration of large amounts of alkali to cases showing these symptoms diminishes or stops vomiting, but does not usually save the patient. The administration of 10 to 15 grams of alkali daily for several days from the earliest possible moment, with full doses of antitoxin, appears to prevent the onset of these symptoms.

Analysis.—Methods used: Acidity, neutralization in presence of neutral potassium oxalate and phenolphthalein. NH_3 , formalin method. Total N, Kjeldahl's method. Acetone and oxybutyric acid, Shaffer and Mariott. NaCl, by Volhard's method.

REFERENCES.

- ¹ Beesley, BRITISH MEDICAL JOURNAL, 1905, vol. i, p. 1142.
- ² Cushny's Pharmacology, p. 532.
- ³ Crile, BRITISH MEDICAL JOURNAL, October 28th, 1916, p. 590.
- ⁴ Van Noorden, Metabolism and Pract. Med., vol. iii, p. 593.

SEVERAL leading physicians of Rio de Janeiro have taken steps for the establishment of model sanatoriums in different regions of Brazil. The first is to be erected among the Italiya hills near the capital.

SURGEON-GENERAL BRAISTED, of the United States navy, in a recent report to Secretary Daniels, states that typhoid fever and other infectious diseases have been practically extinguished in the service by modern methods of prevention. Notwithstanding the vast increase in the personnel since the entry of America into the war fewer than ten cases of enteric have been reported in that period. The only diseases that cause any trouble at present are those due to infection through the respiratory passages, especially mumps and measles; and in all these the death-rate is very low.