tadpole growth and differentiation. The tadpole is little susceptible to either infections or operative shock, and new grafts can be added at will. Judged by the thyroid grafts it would seem that the transplanted tissues deliver the secretions into the blood stream in a more normal manner than when the tissues are fed to the animal, or when their extracts are injected. The effect of some tissues cannot be tested by the feeding method owing to their destructive action of the digestive juices; and an operation once in 3 weeks is preferable to a hypodermic injection each day. Another problem involved is the effect upon the transplanted tissue, and the ease with which the histological changes within the graft can be correlated with the effects upon the tadpole.

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Treatment of Dehydration of Diarrhea with Parenteral Fluids. I. Effect on Acid-base Status of Blood.

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(Introduced by Oscar M. Schloss.)

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Relief of the clinical symptoms of dehydration in infants with diarrhea is usually secured by the prompt and energetic administration of parenteral fluids. The assumption is generally made that the disturbed chemical relations in the blood are simultaneously improved. Hartmann,[1] however, has recently presented data from which he concludes that the injection of NaCl solution in severely dehydrated infants may lead to a rising chlorine concentration with a consequent fall in bicarbonate content. He assumes that continuing oliguria must be present to permit the development of this unfavorable result. The explanation offered for the acid-producing power of the neutral salt NaCl is the inability of the body to rid itself of the chlorine-ions by excretion through the kidneys as rapidly as the sodium-ions are lost through the intestine. This theory takes proper cognizance of the seriousness of oliguria[2] but at the same time leads to confusion by assuming that a restoration of urine flow is impossible—an assumption which we believe is untenable.

[1] Hartmann, A. F., *Am. J. Dis. Child.*, 1928, xxxv, 557.

[2] Schloss, O. M., *Am. J. Dis. Child.*, 1918, xv, 165.

We studied the acid-base status of the bloods of 14 dehydrated infants who were treated with parenteral fluids sufficient in quantity to produce and maintain diuresis. The routine treatment comprised the use of hypodermoclyses of physiological solutions of NaCl (about 20 cc. per pound of body weight) followed by intravenous injections of 10% glucose solution (about 10-12 cc. per pound of body weight) to assist in diluting the plasma and to promote urine flow. This procedure was repeated as indicated by clinical and laboratory findings. Every degree of dehydration was represented but the majority of the cases were of moderate severity. Four of the 14 infants died.

Blood samples were collected before and at variable intervals during treatment. The specimens were drawn without stasis, were immediately placed under oil and the sera analyzed for total fixed base and the most important acid radicles, including chloride, bicarbonate, protein and phosphate. The acid and base values so obtained were compared by converting them to cc. of 0.1 N acid and alkali solutions.

The adequacy of the parenteral fluid treatment in restoring the excretory function of the kidneys was estimated by measuring the volumes of urine passed by 6 of the infants during 8 collection periods. These volumes varied from a minimum of 200 cc. to a maximum of 520 cc. per 24 hours, the average output being 315 cc. daily. This amount somewhat exceeds that voided by well infants of similar weights while on corresponding diets. It is reasonable to assume that a comparable degree of diuresis was produced in the other patients.

With the institution of diuresis by the treatment outlined above none of the 14 infants showed an initial lowering of his serum bicarbonate content. The concentration of chlorine in the serum decreased in 10 of these 14 patients. It is evident then that the great majority of the infants exhibited, even during periods of greatly increased NaCl intake, the 2 chief changes indicative of a return of the blood toward a normal acid-base status. This favorable response was initiated to a surprising degree even in the 2 moribund patients who survived only 5 and 6 hours, respectively, following admission to the hospital.

Four of the 14 infants showed moderate increases in chlorine concentration in the first blood samples taken after treatment. In succeeding analyses, 3 of these 4 infants showed a fall in the concentration of chlorine. No further chemical data were secured from the fourth infant because of his rapid clinical recovery. It is important to emphasize again that in every one of these 4 infants

the bicarbonate content rose slightly in spite of the increased chlorine-ion concentration. This rise in bicarbonate was rendered possible by an increase in the total base content and a fall in the protein concentration.

Our study reveals that when diuresis was successfully established and maintained there is no evidence to support the view that injections of sodium chloride solutions in dehydrated infants further deplete the lowered alkaline reserve.

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Treatment of Dehydration of Diarrhea with Parenteral Fluids. II. Effect on Excretion of Fixed Acid and Base.

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Hartmann[1] believes that diarrhea increases the relative loss of fixed base* from the body, first because there is a less complete resorption of alkaline intestinal secretions, and second, because with the accompanying oliguria there is a decreased excretion of fixed acids.* He states that the parenteral injection of NaCl solution may augment the accumulation of fixed acids in the blood by the retention of chlorine-ions leading to a reduction of the plasma bicarbonate content. He cites that portion of the data published by Holt, Courtney and Fales[2] which shows that loose stools contained much larger quantities of fixed base, especially sodium and potassium, than did normal stools. He failed, however, to point out the fact that the excretion of the fixed acids increased in a proportionate manner. Furthermore, the data are unsuited to an adequate consideration of the total loss of acid and base from the body because of the lack of published analyses of the urines.

In an attempt to add to the available data we determined the quantities of fixed acids and base in both the urine and stools of 6

[1] Hartmann, A. F., *Am. J. Dis. Child.*, 1928, xxxv, 557.

* The term "fixed base" refers to sodium, potassium, magnesium and calcium. The fixed acids are chloride, phosphate and sulfate. In this report comparison is made between the 2 calculated as cc. of 0.1 N acid and alkali solutions.

[2] Holt, L. E., Courtney, A. M., and Fales, H. L., *Am. J. Dis. Child.*, 1915, ix, 213.