a woman of 59 years of age, Dec. 23, 1921. Figure 2b, Dec. 29, 1923, shows the development of a left axis deviation and an increase in amplitude of the R and S waves. Figure 2c, Nov. 10, 1927, illustrates a further increase in voltage of the Q R S group and a flattening of the T wave in lead I; figure 2d, Nov. 1, 1928, illustrates a further increase in voltage of the R and S waves with the T wave in lead I definitely inverted. These records cover a period of 7 years.

4308

The Transplantation of Mammalian Tissues into Amphibian Tadpoles.

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Experiments were undertaken to test the effects of heteroplastic grafts in animals as widely separated as mammals and amphibia. Testicular and thyroid tissues from albino rats were placed in the larvae of *Rana catesbiana*, and other experiments are in progress with both embryonic and adult tissues.

In the first series of grafts no effort was made to control temperature, the experimental animals being left at room temperature of approximately 20°, subject to diurnal fluctuations. The tissues to be grafted were removed aseptically, and simply placed within the coelomic cavity of the tadpole, the coils of the intestine keeping the transplant in place against the peritoneum of the body wall. The operative animals were kept in tap water.

Histological preparations of the tissues show that after 2 days the testicular grafts become adherent to the body wall, and embryonic connective tissue cells from the tadpole begin to invade the transplant. Growth is more rapid near a broken surface, *i. e.*, at the point where the graft lies near the incision in the body wall. At 4 days, encapsulation by the host is well under way, with an interlacing of connective tissue fibers between the tunica of the testis and the peritoneum of the host. The germinal epithelium shows some degeneration but mitotic cells are still evident. At this time capillaries from the tadpole enter the transplanted tissue, the vessels following the trabeculae of the invading connective tissue. The blood supply in most cases comes from the body wall, though it may come from the serous coat of the intestine.

At 12 days the entire germinal epithelium of the graft has practically degenerated, most of the cells showing a complete lack of stainable chromatin. The ripe spermatozoa are intact, and as no developing spermatocytes are present, it is presumed that the former are the original sperm. In the interstices between the tubules are agglomerations of leucocytes and cells which appear to be testicular interstitial cells. The latter are more numerous than in the normal testis. Their history has not yet been accurately traced.

When the operative animals are kept at 10° C., the entire process is slowed down. The tadpole responds more slowly, the process of encapsulation and vascularization being hardly more advanced at 12 days than in room temperature experiments of 4 days. The degenerative processes of the epithelium within the graft are equally slow, the chromatin material of the peripheral cells appearing normal.

Thyroid grafts present greater difficulties of technique, the minuteness of the transplant preventing it from being held firmly to a vascular surface of the host; and even where this has been accomplished the invasion of capillaries is absent, the tadpole responding by merely encapsulating the foreign tissue. Due to the physiological effects of the thyroid secretion, not more than one-third of a rat's thyroid can be placed in a tadpole. Transplantation of the entire gland resulted in death (in 6 cases) in 40 to 48 hours. Tadpoles into which half a thyroid was grafted lived 9 to 11 days and, at the time of death, had developed pectoral limbs, and the tail was being rapidly absorbed. One-third of a thyroid caused a still slower metamorphosis. The pectoral limbs developed and the animals came frequently to the surface for air, showing that the respiratory system was becoming modified toward the adult type. The tail showed only slight absorption.

In these thyroid experiments the morphological changes were coincident with the changes taking place within the transplanted tissue. For 3 weeks the metamorphic changes proceeded steadily, the legs developing as the head and body assumed the proportions and shape of the adult. During the week following the process of development was much slower and, after the fourth week, no further differential development could be observed. At the end of 6 weeks the transplanted tissues were sectioned and showed that the normal histological structure of the thyroid had entirely disappeared.

This is a preliminary report of extended experiments which are now in progress. Even though it may eventually be shown that the grafted tissue does not continue active growth, the method seems to be of value in testing the effects of mammalian tissues upon

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.