

taining 2 exact units. The tubes were incubated in a water bath at 37°C for 2 hours and 0.4 ml of a mixture containing equal parts of 2% washed sheep erythrocytes and hemolysin (2 units per 0.2 ml) was added to each of the tubes. The tests were read after further incubation for 30 minutes. Complete fixation was recorded as 4+ and complete hemolysis as 0. The usual controls were included. The results of these tests are shown in the accompanying table.

An analysis of the results would indicate that antigens prepared from infected mouse muscle tissue give specific fixation of complement in the presence of homologous guinea pig immune serum. These sera failed to fix complement in the presence of comparable dilutions of antigens prepared from normal mouse muscle tissues. Centrifugation of crude antigens further increased the specificity of the test as shown by the comparable titers obtained with the virus antigen after centrifugation at 2500 r.p.m., whereas non-specific fixation was virtually eliminated. Further centrifugation at 5000 r.p.m. did not

improve the antigen. Additional studies on the use of other purification procedures and on the reactivity of antigens prepared with other serologic types are in progress.

Preliminary observations on the use of this procedure in analyzing the sera from patients from whom the virus has been isolated, patients suspected of infection with this virus, and from presumably normal individuals, indicate that the complement fixation test may be of value in the study of Coxsackie infection in the human.

Summary. The technique of a complement fixation test which may prove of value in the study of Coxsackie virus infection in man is described.

Addendum. Since this manuscript was submitted for publication, Casals *et al.*, Howitt and Benefield, and Melnick *et al.* have reported complement fixation with strains of Coxsackie virus.

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Homologous Transplantation of Fetal Endocrine Tissue to Adult Non-Related Host.* (17677)

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This report concerns itself with the surgical transplantation of endocrine tissues to normal animals. Previous investigators have made either autographs [Halstead(1), Ingle (2)] of the parathyroids and the adrenals, or syngenesiographs [Pomerat(3), Robertson(4) and

Turner(5)] of the adrenal and ovary. Review of the literature reveals no reports of successful transplantation of endocrine tissue to animals of the same species which are not closely related—a homologous graft. Greene(6) has demonstrated that embryonic tissues, like cancer tissue, possess autonomy and may be transplanted to the anterior

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1. Halstead, W. S., *J. Exp. Med.*, 1909, v11, 175.
2. Ingle, D. J., and Higgins, G. M., *Endocrinology*, 1938, v22, 458.

3. Pomerat, C. M., Breckenridge, C. G., and Gordon, L., *Endocrinology*, 1944, v34, 60.

4. Robertson, G. C., *Proc. Soc. Exp. Biol. and Med.*, 1945, v59, 30.

5. Turner, C. D., *Anat. Rec.*, 1939, v73, 145.

6. Greene, H. S. N., *Cancer Research*, 1943, v3, 809.

chamber of the eye of a foreign host. The purpose of this paper is to report the successful homologous transplantation of embryonic adrenal, ovary, testes and thyroid to the anterior chamber of the eye of adult hosts.

Methods. The feti were removed aseptically by cesarean section and the endocrine tissues were removed with the aid of the dissecting microscope. The tissues were transplanted, under local anesthesia, to the anterior chamber of the eye of non-related adult hosts within one to 5 hours after removal. The rabbit fetal tissues were removed between the 18th and 22nd day of gestation, and the guinea pig and dog at approximately the 42nd day. All material for histological study was fixed in 10% formaldehyde and stained with hematoxylin-eosin. The study was controlled in the following manner. At the time of transplantation, a piece of fetal endocrine tissue was fixed for histological study, its size, diameter

TABLE I.

Rabbit Fetal Endocrine Tissue Transplanted to the Anterior Chamber of the Eye of Normal Rabbits, Other Than the Mother.

(A) 21 gonads transplanted:			
3	growing and surviving between 6 to 7 wks.		
3	" " " " " "	9 to 10 "	"
1	" " " " " "		at end of 108 days.
2	regressed between 2 and 3 wks.		
4	" " " " " "	4 " 5 "	"
1	" " " " " "	6 " 7 "	"
7	initial failures.		
Summary: 7 continued to grow 42 days or longer.			
(B) 13 adrenals transplanted:			
2	growing and surviving between 2 and 3 wks.		
1	" " " " " "	6 to 7 "	"
3	" " " " " "	9 " 10 "	"
1	" " " " " "	10 " 11 "	"
1	" " " " " "	13 " 14 "	"
2	regressed between 2 to 3 wks.		
1	" " " " " "	3 " 4 "	"
1	" " " " " "	8 " 9 "	"
1	initial failure.		
Summary: 6 continued to grow 35 days or longer.			
(C) 12 thyroids were transplanted:			
2	growing and surviving between 4 to 5 wks.		
1	" " " " " "	6 " 7 "	"
3	" " " " " "	9 " 10 "	"
1	" " " " " "	13 " 14 "	"
1	regressed between 2 to 3 wks.		
1	" " " " " "	4 " 5 "	"
3	initial failures.		
Summary: 5 continued to grow 42 days or longer.			

TABLE II.

Guinea Pig Fetal Endocrine Tissue Transplanted to the Anterior Chamber of the Eye of Normal Guinea Pigs, Other Than the Mother.

(A) 15 gonads were transplanted:			
2	growing and surviving between 4 to 5 wks.		
2	" " " " " "	5 " 7 "	"
2	" " " " " "	8 " 9 "	"
2	" " " " " "	9 " 10 "	"
1	" " " " " "	10 " 11 "	"
6	initial failures.		
Summary: 7 continued to grow 35 days or longer.			
(B) 15 adrenals were transplanted:			
2	growing and surviving between 4 to 5 wks.		
2	" " " " " "	5 " 6 "	"
1	" " " " " "	6 " 7 "	"
1	" " " " " "	8 " 9 "	"
2	" " " " " "	10 " 11 "	"
1	" " " " " "	14 " 15 "	"
1	died, transplant survived between 2 to 3 wks.		
5	initial failures.		
Summary: 5 continued to grow longer than 42 days.			
(C) 15 thyroid glands were transplanted:			
3	died between 2 to 3 wks, and surviving.		
3	growing and surviving between 4 to 5 wks.		
2	" " " " " "	5 " 7 "	"
3	" " " " " "	8 " 13 "	"
1	still living and growing at end of 150 days.		
3	initial failures.		
Summary: 6 continued to grow longer than 42 days.			

and cellular maturity being noted. The transplanted tissue when removed at a later date is compared with the control section for growth in size, cellular maturity and differentiation. No transplant was classified as a "take" unless there was histological evidence of growth for 30 days or longer.

Results and discussion. Detailed results are listed in Tables I, II and III. There has been a 50 to 60% survival and continuous growth in the homologous embryonic transplants of the adrenal, ovary, testes and thyroid to the adult guinea pig and rabbit. The percentage of "takes" in the dog has been less. We believe this to be primarily a technical problem and are investigating methods to overcome the difficulty. In the fetal thyroids at the time of transplantation the tiny immature follicles are scant with colloid if any at all is present; the transplants removed 30 to 180 days later had increased more than 30 times in volume, there was cellular maturity of the follicles, and each follicle con-

TABLE III.
Dog Fetal Endocrine Tissues Transplanted to the
Anterior Chamber of the Eye of Normal Dogs and
Puppies.

(A)	9 gonads were transplanted:
	1 grew for approximately 60 days and regressed.
	2 abscesses.
	6 initial failures.
(B)	11 adrenal transplants:
	4 "Takes"—2 were growing and surviving between 7 to 8 weeks.
	5 initial failures.
(C)	8 thyroid transplants:
	2 growing and surviving at the end of 30 days.
	6 initial failures.

tained colloid. The fetal ovaries after transplantation show maturity and follicular development, and in the case of the rabbit, the transplant will give a positive Friedman reaction. Rabbit fetal testes removed eighty-five days after transplantation show spermatids. There is increased differentiation of the various zones of the adrenal cortex as well as cellular growth and multiplication of cells. The medulla does not survive. Pancreas transplants removed 30 to 120 days later reveal well formed ducts lined with low cuboidal epithelium, but the Islets of Langerhans have all regressed. We are investigating methods of increasing the percentage of survival by applying Halstead's Law of En-

docrine Deficiency either at the time of transplantation or soon thereafter. We may state that the percentage of "takes" of the ovary and testes has increased from 60% to 90%. This observation will be reported at a later date upon a larger series which is now under investigation. In the case of the adrenal and thyroids, our best growths and survivals have been in those animals which had the corresponding endocrine organs removed. In our laboratory thyroidectomized guinea pigs have homologous fetal thyroid transplants which have been growing for over 10 months. We have also been investigating sites for transplantation other than the anterior chamber of the eye in order to transplant fetal endocrine tissue clinically. In only a few cases have we been successful, this site being the kidney, with the adrenal transplant.

Summary. (1) Embryonic adrenal, ovary, thyroid and testes have been homologously transplanted to the anterior chamber of the eye of normal dogs, guinea pigs and rabbits with a 50 to 60% survival beyond six weeks in the latter 2 species of normal animals. (2) In transplants of pancreas, only the ducts survived. (3) The best growth occurred in those animals in which the corresponding endocrine organ was removed.

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The Preparation of Secretin. (17678)

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Several methods have been described for extraction and purification of secretin but unfortunately these have in general proved to be cumbersome, time-consuming, or unsuitable for producing secretin economically in more than small quantities. The present report describes a simplified procedure for preparation of a potent secretin which has been given intravenously to more than 150 human subjects without evidence of untoward reactions. The potency of various fractions was

tested on dogs by an assay procedure described elsewhere(1) and expressed in terms of the clinical unit established by Hammersten and coworkers(2) which, as was shown by Greengard and Stein(3), is identical with the Ivy

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2. Hammersten, E., Agren, G., and Lagerlof, H., *Acta Med. Scand.*, 1937, v92, 256.

3. Greengard, H., and Stein, I. F., *Proc. Soc. Exp. Biol. and Med.*, 1941, v46, 149.