

arin has no influence on the rate of retrograde blood flow from the distal end of an occluded artery. Heparin is probably of

value in arterial occlusion, not by increasing the rate of flow, but by inhibiting the growth of the thrombus at the site of the occlusion.

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Endocrine Function of Ovarian Tissue after Growth or Storage *in vitro*.*

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In the course of studies on the effects of anterior pituitary hormones on ovarian tissue grown or stored *in vitro*, it was deemed necessary to develop a technic for determining whether the ability of such tissue to produce estrogen was lost. Accordingly a method was developed for testing the function of ovarian tissue by transplanting it, subsequent to storage or culture, into castrate female rats. The viability of ovarian tissues subjected to a variety of physical factors has been measured by Lipschütz¹ in terms of the hyperfeminization of male guinea pigs after implantation of the tissues on the surface of the kidney. Grafts of thyroid,² parathyroid,² pancreas,³ pituitary,⁴ and adrenal⁵ tissues have been grown in culture prior to implantation in an attempt to acclimatize the tissue to its prospective host, but the routine implantation of cultured endocrine tissue to measure its function has not been utilized previously.

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¹ Lipschütz, A., *Proc. Second Internat. Cong. Sex Research* (1930), 1931, 94; *Compt. Rend. des Seances de l'Acad. des Sci.*, 1932, **195**, 1107.

² Stone, H. B., Owings, J. C., and Gey, G. O., *Lancet*, 1934, **1**, 625; *Am. J. Surg.*, 1934, **24**, 386; 1934, **100**, 613; *Surg. Gynec. and Obst.*, 1935, **60**, 390.

³ Murray, M. R., and Bradley, C. T., *Am. J. Cancer*, 1935, **25**, 98; Selle, W. A., *Am. J. Physiol.*, 1935, **113**, 118.

⁴ Haymaker, W., and Anderson, E., *J. Path. and Bacteriol.*, 1936, **42**, 399.

⁵ Lux, L., Higgins, G. M., and Mann, F. C., *Anat. Rec.*, 1937, **70**, 29; 1937, **67**, 353.

Ovaries from Sprague-Dawley rats, 28 to 32 days of age, were cut into pieces approximately one mm square, maintained *in vitro* under varied conditions, and implanted into the anterior chamber of the eye of adult, castrate females of the Sprague-Dawley strain. Vaginal smears were taken daily and the condition of the implant observed. A smear composed of cornified cells and a few leucocytes was considered a sign of the functional activity of the graft. The possibility of hypertrophied ovarian rests being the source of the vaginal stimulation was checked by removal of the grafts. In every case this procedure was followed by return to a typical castrate vaginal smear.

The ovaries were treated in the following way: (a) cut in human placental serum and implanted directly; (b) maintained *in vitro* for 5 days at 37°C, using the roller tube method of culture;⁶ (c) prepared as in (b) but kept at 10°C for 5 days; (d) cut into small pieces, frozen in liquid air, and transplanted immediately or after storage for 2 days at -10°C.

A thick capsule of fibroblasts was observed in the 36-hr-old cultures maintained at 37°C. After implantation vascularization of the grafts by the small vessels of the iris occurred in 2 or 3 days. Rapid growth followed the establishment of a blood supply and in 10 to 14 days the grafts completely filled the anterior chamber. Large follicles and corpora lutea were seen in many of the grafts.

⁶ Gey, G. O., and Gey, M. K., *Am. J. Cancer*, 1933, **17**, 752; 1936, **27**, 45.

TABLE I.
Vaginal Cornification Following Implantation of Ovarian Cultures.

Treatment of ovaries	Host animals		Days from implantation to cornification	
	No. with implants	Showing vaginal cornification %		
			Avg	Range
Direct transfer	8	100	13	6-16
Cultured 2-5 days, 37°C	20	75	14	8-24
" " " 10°C	13	76.9	13	11-17
Frozen quickly in liquid air	14	0	—	—

The results presented in Table I show that the transplanted ovarian tissue which had been maintained at 37°C or 10°C became functional, in terms of vaginal cornification, in approximately the same length of time as the tissue transplanted immediately. Ovarian tissue frozen quickly in liquid air did not produce vaginal cornification during 50 days of observation. Vaginal smears characteristic of estrus were observed in approximately 75% of the animals receiving ovaries maintained both at 37°C and at 10°C, whereas all of the animals receiving ovarian tissue implanted immediately after removal from the animal showed such smears.

The practicability of the test for endocrine function has been demonstrated for ovarian tissue and it is probable that it will be applicable to small pieces of any of the en-

docrine organs. The anterior chamber of the eye is easily accessible for implantation, observation, and graft removal, and provides an adequate blood supply with relatively little pressure or congestion.

Summary. A method has been described for testing the endocrine function of ovarian tissue after growth in culture at 37°C or storage at 10°C. Such tissue, when transplanted into the anterior chamber of the eyes of castrate female rats, after a latent period of from 8 to 24 days, produced typical estrous type of vaginal smears which compared favorably with the effects produced by transplants made directly after the removal of the tissue from the donor animal. Ovarian tissue frozen quickly in liquid air failed to produce cornification of the vaginal epithelium.

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External Field of the Nerve Impulse.

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Since the time of Hermann,¹ the conception of the nerve impulse as a self-propagating electric stimulus has become more and more widely accepted. Within the last few years several experiments have been reported purporting to test the consequences of this view of the impulse as an electrical circuit with two longitudinal resistive components (the transverse ones do not concern us here), one within the core of the axon itself, the

other existing outside the core and involving the surrounding media.²⁻⁴

An additional possible consequence of the local circuit theory concerns the electro-

¹ Hermann, L., *Pflüger's Arch.*, 1899, **75**, 574.

² Hodgkin, A. L., *J. Physiol.*, 1939, **94**, 510.

³ Katz, B., and Schmitt, O. H., *J. Physiol.*, 1939, **96**, 9P-10P.

⁴ Katz, B., and Schmitt, O. H., *J. Physiol.*, 1940, **97**, 471.