and everted vessel (Fig. 2, B). As soon as the vessel has been pulled down far enough, one forceps is removed from the edge and is placed about the vessel and cannula to hold it for tying. The outer vessel is tied in the first groove, at 6, Fig. 1, C. The "bull dog" clips may now be removed from both vessels.

The anastomosis, thus completed, approximates endothelium to endothelium without the possibility of metal or thread coming into contact with the blood flowing through the anastomosis (Figs. 1, C and 2, C).

This method of blood vessel anastomosis is very simple, can be performed in a few minutes and is always successful if properly done. Neither thrombosis nor leakage occur after many hours of blood flow. It should also be pointed out that with the above described technique not only can anatomically similar vessels of quite different calibre be anastomosed together, be they arteries or veins, but artery may be anastomosed to vein, or *vice versa*.

9875

Conversion of Succinic Acid to Glucose in the Phloridzinized Dog.

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Koranyi and Szent-Györgyi have reported[1] that succinic acid will decrease the ketosis in diabetes. Although other investigators[2, 3] have been unable to confirm this observation it has renewed interest in the behavior of succinic acid in metabolism. Ringer, Frankel and Jonas in a widely quoted study[4] found that extra glucose was excreted when sodium succinate was fed to the phloridzinized dog. It seemed desirable to reëxamine this point for various reasons. Our experiments are summarized in Table I. All pertinent data are included with the exception that 6 gm. of NaCl were administered daily by stomach tube in order to obtain good urine volumes. The bladder was emptied by catheter at the end of each 24-hour period of urine collection. Urine ketones were determined

1 Koranyi, A., and Szent-Györgyi, A. V., *Dtsch. med. Wschr.*, 1937, **63**, 1029.

2 Lawrence, R. D., McCance, R. A., and Archer, N., *Brit. Med. J.*, 1937, **2**, 214.

3 Dunlop, D. M., and Arnott, W. M., *Lancet*, 1937, **233**, 738.

4 Ringer, A. I., Frankel, E. M., and Jonas, L., *J. Biol. Chem.*, 1913, **14**, 539.

TABLE I.

Day	Urine Excretion: Urine Vol. ml.	Total acetone bodies gm.	Nitrogen gm.	Dextrose gm.	D:N	Extra dextrose mm.	Succinic acid fed mm.	% succinic acid → glucose
Exp. 1—Mongrel terrier, male, weight 21.7 kg. Fasted for 4 days before and throughout experiment. Given 1 gm. phloridzin in oil twice daily for 3 days before and throughout experiment.								
1	1220	3.24	6.48	21.9	3.38			
2	1630	2.56	11.24	35.4	3.16			
3	1295	6.15	10.11	34.6	3.41			
4	1740	6.02	8.51	38.7	4.53	20.3	42.4	96.0
5	1920	6.14	9.56	41.2	4.32	16.7	42.4	79.3
6	2020	4.97	8.17	27.3	3.34			
7	1350	5.08	7.60	24.7	3.27			
Exp. 2—Spaniel, male, weight 16 kg. Fasted for 3 days before and throughout experiment. Given 1 gm. phloridzin in oil once daily for 2 days before and throughout experiment.								
1	1660	1.49	18.00	63.8	3.54			
2	940	2.71	14.41	51.6	3.58			
3	860	3.48	17.28	57.0	3.29			
4	980	1.32	10.30	57.2	5.54	36.4	424.0	17.2
5	650	0.60	6.58	48.0	7.28	66.6	424.0	31.5
6	620	2.63	9.68	34.6	3.57			
7	890	6.04	11.60	40.8	3.52			
Experiments of Ringer, Frankel and Jonas (*J. Biol. Chem.*, 1913, **14**, 539).								
Succinic acid given *per os*						26.0	100.0	52.0
" " " subcutaneously						47.7	100.0	95.4

by Van Slyke's method, total nitrogen by the macro-Kjeldahl method and sugar by Benedict's method. The succinic acid was fed in the free state and there was no diarrhea.

In estimating dextrose formation from a fed compound by means of the D:N ratio in the urine of the phloridzinized dog it is necessary to base your conclusions upon the highest ratio which is obtained in various experiments. On this basis our results (Exp. 1, 4th day) confirm the best observation of Ringer, *et al.*,[4] and indicate that in the phloridzinized organism succinic acid may be entirely converted to dextrose (2 mols. succinic acid = 1 mol. dextrose). However, an explanation of the relatively low percentages of conversion of succinic acid to dextrose in our Exp. 2 when large doses were fed, is necessary. This is exactly what happens when large doses of sugar are fed to the phloridzinized organism. There is no intrinsic impairment of the ability to oxidize carbohydrate in the phloridzinized dog.[5] The unnatural gradient of tissue sugar → blood sugar → urine simply reduces or prevents its oxidation. If

[5] Deuel, H. J., Jr., *J. Biol. Chem.*, 1930, **89**, 77.

enough carbohydrate or, as in this case, dextrose former is given, the gradient tissue sugar → blood sugar, becomes reversed enough to approach normal and permit an increase in dextrose oxidation. The latter is evident in Exp. 2 in the antiketogenic and nitrogen sparing effects of the succinic acid.

Summary. In the phloridzinized dog the changes in the D:N ratio indicate that small doses of succinic acid are entirely converted to dextrose (2 mols. succinic acid = 1 mol. glucose). When larger doses are given a smaller percentage is excreted in the urine as sugar but anti-ketogenic and nitrogen sparing activity indicate its conversion to dextrose before being burned.

9876 P

Atrophy of Thymus of the Rat Resulting from Administration of Adrenocorticotropic Hormone.*

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Some time ago publication was made from this laboratory of the rapid atrophy of the thymus on the administration of the gonadotropic hormone in pregnant mare serum.[1] The phenomenon was not seen in males or females after castration and was tentatively referred to the increased production of sex hormones on the part of the gonad. Selye, Browne and Collip[2] have noted atrophy of the thymus following administration of progesterone. Selye, Harlow and Collip,[3] and Schacher, Browne and Selye[4] subsequently produced regression of the thymus by administration of estrogenic, as well as androgenic substances. The preparation of adrenocorticotropic and mammotropic hormones in this laboratory has resulted in their administration under a variety of conditions. It became apparent very soon that invariable prompt reduction in size and almost

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1 Evans, H. M., and Simpson, M. E., *Anat. Rec.*, 1934, **60**, 423.

2 Selye, H., Browne, J. S. L., and Collip, J. B., PROC. SOC. EXP. BIOL. AND MED., 1936, **34**, 472.

3 Selye, H., Harlow, C. M., and Collip, J. B., *Endokrinologie*, 1936, **14**, Heft 1/2.

4 Schacher, J., Browne, J. S. L., and Selye, H., PROC. SOC. EXP. BIOL. AND MED., 1937, **36**, 488.