

of galactin per pituitary gland as compared with glands from normal estrous cycle females, and at 21 days pregnancy there is an increase in potency of the glands as compared with those from rats pregnant for 12 days. Forty-eight hours postpartum there is a doubling of the galactin content of the pituitary gland over that of the glands from either the normal estrous cycle female or the female pregnant for 21 days. At 10 days postpartum the galactin content of the glands decreases somewhat, being about midway between the glands from 48 postpartum rats and glands from normal estrous cycle females.

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Arbutin Diabetes.

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The site of action of phlorhizin in phlorhizin diabetes is now recognized as being in the kidneys,¹ the disturbance caused by the drug being apparently due to inability of the tubule to reabsorb glucose. This, according to Lundsgaard,² arises from the fact that the poisoned tubule is unable to carry out phosphorylation of glucose. Moreover, several glucosides, including phlorhizin, are now known to inhibit phosphorylation *in vitro*, and glucose resorption in the isolated perfused frog kidney is also inhibited.³ It occurred to us that the glycosuric effect of phlorhizin might be a property common to all these glucosides. The action of arbutin, amygdalin, and salicin on healthy, fasting dogs was studied according to the procedure and methods of urine and blood analyses customary with phlorhizin.

Arbutin is, like phlorhizin, a phenol glucoside. When injected subcutaneously in sterile distilled water twice daily in fasting dogs, it caused a diabetes similar to that produced by phlorhizin with lowered blood sugar and acetone bodies in the urine, the ratio of

* These data are to be submitted to the Graduate School of Yale University in partial fulfilment of the requirement for the degree of Doctor of Philosophy.

¹ Deuel, H. J., Jr., Wilson, H. E. C., and Milhorat, A. T., *J. Biol. Chem.*, 1927, **74**, 265.

² Lundsgaard, E., *Biochem. Z.*, 1933, **264**, 221.

³ Abderhalden, E., und Effkeman, G., *Biochem. Z.*, 1934, **268**, 461.

dextrose to nitrogen in the urine being 1.45, 1.56, 1.50, and 1.92 in 4 different dogs. The urinary reducing substance was dextrose, for after yeast fermentation the urine no longer reduced Benedict's reagent. In contrast to the diuresis of phlorhizin diabetes, the urine of the animals receiving arbutin, likewise of those receiving the amygdalin and salicin, was very scanty unless water was administered by stomach tube, but the voluntary intake of water also was very small.

TABLE I.
Typical Protocol: Dog A1.

Date 1935	Arbutin gm.	cc.	Urine			Acetone bodies mg./spec.	Blood Sugar mg. %
			Dextrose gm.	Nitrogen gm.	D:N		
7/6	2.5+2.5	0					
7	5	0					
8	2.5+2.5	0					
9	2.5+5	310	4.53	12.88	(.35)	—	
10	5+5	490	Urine discarded (stool)				
11	5+5	210	4.47	3.38			
			4.00s	3.29s	1.22s	—	85
12	5	250	4.10s	5.35s	.77s	41.4	
13	5+5	265	3.63s	4.54s	.80s	204.0	60
14	5	285a	9.63s	3.94s	2.44s	197.3	
		120b	2.32	1.89	1.23	56.7	
15	5+5	85	2.68s	1.15s	2.33s	83.8	67
16	5+5	260	7.15	4.72	1.51	324.0	
17	0	280	5.86s	4.57s	1.28s	266.0	55
18	0	90					
19	0	110					56
					11.48		
					Av. 1.45		

Injections on 7/6 through 7/11 made with oil suspension of drug; all injections subsequent to this made with aqueous solution.

s indicates determinations made on filtrate after Somogyi precipitation to remove fecal proteins.

a—urine collected at 9:30 a.m. contaminated with feces.

b—urine collected at 1:00 p.m. clear.

Female German Shepherd, fasted 2 days before injection.

Three fasting dogs injected subcutaneously with salicin, an alcohol glucoside, in sterile distilled water exhibited no glycosuria nor ketonuria; nor did 3 dogs similarly injected with amygdalin, an aldehyde glucoside.

Lundsgaard⁴ found that phlorhizin inhibits glycolysis of excised tissues. Arbutin, like phlorhizin, appears definitely to inhibit glycolysis in brain, striated and cardiac musculature (0.1% glucose in double molar concentration Sorenson phosphate buffer of pH 7.4).

⁴ Lundsgaard, E., *Biochem. Z.*, 1933, **264**, 209.

TABLE II.
Effect of Arbutin (M/25) on Glycolysis Lactic Acid mg. %.

Time min.	Brain		Striated Muscle		Cardiac Muscle	
	Without	With	Without	With	Without	With
0	120		54		162	
30	422	160	257	101	342	250
90	430	246	373	143	372	146

In contrast with phlorhizin and arbutin, the results with salicin and amygdalin were inconclusive.

Since glycolysis may involve dehydrogenation at some point in the process, the effect of these drugs on the reduction time of methylene blue by rat kidney slices with and without glucose and sodium lactate was studied according to the Thunberg technique. All 4 drugs retard the reduction time with and without added substrate. The results are shown in Table III.

TABLE III.

Kidney slices	Without added substrate		With glucose		With lactate	
	A	B min.	A	B min.	A	B min.
Without drug	12	38	13	36	11	27
M/100 Phlorhizin	8	74	9	65	9	53
M/25 Arbutin	17	67	17	58	18	48
M/25 Salicin	12	75	13	58	12	45
M/25 Amygdalin	12	66	13	66	11	49

A—number of determinations.

B—average of the determinations listed in column A = average reduction time.

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Transformation of Bacterial Types.*

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In previous papers the isolation and description of numerous variant forms of *Micrococcus tetragenus* was reported.¹ It was at first believed that these interchangeable variants composed a complex system of bacterial variation different from the orderly one associated with other bacteria. A clue to the solution of the prob-

* This work was done in the Department of Medicine at the University of Minnesota Hospital and was aided by a grant from the Graduate School Fund.

¹ Reimann, H. A., *J. Bact.*, 1936, **31**, 385, 407.