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Studies on acetol as an intermediary product in carbohydrate metabolism.

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In view of the fact that it has been demonstrated that acetol results in small amounts from the distillation of a large variety of the simpler carbohydrates with weak sodium bicarbonate solution,[1] an investigation was undertaken to determine whether such a change might not be a normal physiological process.

Greer, Witzemann, and Woodyatt[2] fed 10 and 20 gm. doses of acetol to dogs and in three experiments could demonstrate no extra glucose, and believed there was some evidence that this substance was partially converted to the acetone bodies. Acetol was made by the method outlined by Nef.[3] In the first series of experiments it was fed to a normal dog together with *o*-aminobenzaldehyde in order to determine whether the combination between acetol and *o*-aminobenzaldehyde into a readily detectable fluorescent 3-oxyquinaldine would take place *in vivo* as it does *in vitro*.[4] Since this combination could not be brought about in the animal organism, it was impossible by feeding *o*-aminobenzaldehyde to demonstrate the presence of acetol normally in the dog.

In the second set of experiments acetol was fed to the completely phlorhizinized dog on the fourth or fifth day of phlorhizination and the amount of any extra production of sugar was determined by calculations based on the prevailing D:N ratio. In the protocols given below only the results of the analyses from the fourth day are given. Urinary nitrogen was determined by the Kjeldahl method, glucose by the Benedict method, and total acetone bodies by the procedure of Van Slyke. In order to

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[1] Baudisch, O., and Deuel, H. J., Jr., *J. Am. Chem. Soc.*, 1922, xliv, 1585.

[2] Greer, J. R., Witzemann, E. J., and Woodyatt, R. T., *J. Biol. Chem.*, 1913-14, xvi, 455.

[3] Nef, *Ann. d. Chem.*, 1904, cccIxv, 260.

[4] Baudisch, O., *Biochem. Z.*, 1918, lxxxix, 279.

Dog	Date	Catheterization	Phlorhizin	Urine							Remarks.
				Vol.	Dextrose	Nitrogen	Extra glucose	D : N	Acetone bodies	Acetone per hr.	
1			gm.	cc.	gm.	gm.	gm.		gm.	gm.	
	Feb. 1	9:45	1								
	Feb. 2	9:45	1	610	22.36	6.86		3.25			10 gm. acetol
		1:30		160	3.38	0.96		3.53			given at 1:45
		6:35		225	8.81	1.81	2.42	4.86			p. m.
		10:35		205	4.73	1.39		3.64			Some vomited.
2	Feb. 21	10:00	1								
	Feb. 22	9:35	1	610	25.59	7.55		3.39	0.554	0.0236	
		2:35		186	5.72	1.76		3.25	0.103	0.0206	10 gm. acetol
		7:35		430	12.60	1.79	8.07	7.04	0.186	0.0372	given at 3:10
		12:35		205	5.96	1.44		4.14	0.165	0.0330	p. m.
	Feb. 23	9:35	1	545	8.45	2.61		3.24	0.370	0.0411	
		2:35		270	4.34	1.35		3.22	0.246	0.0492	7.06 gm. acetol
		7:35		468	4.42	1.32	0.68	3.35	0.137	0.0274	given at 3:40
		12:35		182	4.99	1.39		3.59	0.104	0.0208	p. m.
	Feb. 24	9:35		490	8.17	2.44		3.31	0.289	0.0321	
3	Mar. 11	9:55	1								
		12:55		125	2.40	0.93		2.58	0.315	0.1050	10 gm. acetol
		4:55		180	4.83	1.30	3.17	3.71	0.286	0.0715	given at 1:00
		8:55		676	4.07	0.92		4.42	0.314	0.0785	p. m.
	Mar. 12	12:55		425	4.36	1.27		3.35	0.234	0.0585	
		9:55	1	350	6.81	2.16		3.15	0.235	0.0261	
		12:55		164	2.27	0.26		8.73			Dog shivered.
		3:55		172	2.03	0.56		3.62			10 gm. acetol
		7.55		233	1.91	0.53		3.60			given at 4:00
4		Dog previously shivered.									p. m.
	April 16	9.10	1								Dog died.
		1:10		225	4.25	1.41		3.01			10 gm. acetol
		5:10		365	4.93	1.37	0.20	3.59			given at 1:10
		9:10		240	5.05	1.88		2.70			p. m.
		12:10		212	2.60	0.76		3.42			
	April 17	9:10	1	430	8.33	2.69		3.10			10 gm. acetol
		1:10		472	4.31	1.24	0.42	3.47			given at 9:10
		4:40		450	3.21	1.05		3.06			a. m.

determine whether acetol was excreted unchanged after its administration, the urine was distilled in slightly acid solution and a reduction test made on the distillate, always with negative results.

In the first three experiments, in which the animal was not caused to shiver—to completely rid it of glycogen—during a preliminary period, a marked rise in glucose excretion resulted after the introduction of 10 gm. of acetol, which was not manifest on the administration the following day of 7 gm. of this substance (in dog 2). Moreover, when another animal (dog 4) was caused to shiver on the third day of phlorhizination, by bathing it in ice water followed by a two-hour stay in a cold room, no increase in urinary glucose resulted from the first administration of acetol nor from the ingestion of the same amount on the following day. Albuminuria was not present in three experiments, as found by Greer, Witzemann, and Woodyatt.[2]

No evidence is available to show that this substance gives rise to acetone bodies. Just why it is not converted to glucose is problematical in view of the fact that the phlorhizinized dog converts into sugar many closely related substances.

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Some results obtained by the treatment of nervous phenomena with glucose.

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Recently Edwards, Page and Brown[1] have described cardiovascular disturbances accompanying insulin hypoglycemia in dogs. They found that insulin brought about certain irregularities in heart action, a slight decline in mean blood pressure and a lowered CO_2 capacity of the blood. Similar results associated with nervousness have been observed following the injection of

[1] Edwards, J. J., Page, I. H., and Brown, P. K., PROC. SOC. EXP. BIOL. AND MED., 1924, xxi, 170.