progesterone. In agreement with earlier reports there was no follicular maturation or luteinization in the earlier stages of treatment in our rats.

Summary. Gonadotropic extracts of human pregnancy urine or pregnant mare's serum cause masculinization of female rats if treatment is started at 6 days of age and continued until the thirtieth day. The hypertrophy of the clitoris, prepuce and preputial glands is quite comparable to that induced by a similar course of treatment with testosterone. A gonadotropic pituitary extract did not cause any masculinization.

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Absorption of Glucose from the Stomach of the Dog.

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It is surprising that on so simple a subject as the fate of glucose in the stomach the published opinion is not of one accord.[1-13] Verzar and McDougall[14] state that "there is practically no absorption of carbohydrates in the stomach."

London and Tschekunow[9] in experiments on dogs with gastric fistulæ concluded that glucose was not absorbed during approximately a one-hour period. McLeod and his associates[10] reported similar observations in the rat when the pylorus was ligated.

More recently Maddock, Trimble and Carey[11] reported data from experiments on dogs from which they concluded that there was no

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8 Holtz, F., and Schreiber, E., *Biochem. Z.*, 1930, **1**, 224.

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11 Maddock, S. J., Trimble, H. C., and Carey, B. W., *J. Biol. Chem.*, 1933, **103**, 285.

12 Maddock, S. J., *J. Lab. and Clin. Med.*, 1932, **17**, 369.

13 Shay, H., Gershon-Cohen, J., and Fels, S. S., *Ann. Int. Med.*, 1938, **11**, 1563.

14 Verzar, F., and McDougall, E. J., *Absorption from the Intestine*, Longmans, Green and Co., London, Eng., 1936.

absorption of glucose from the stomach and no change in the blood sugar level of either the gastric or peripheral venous blood after the ingestion of various concentrations of glucose. In one series of experiments the pylorus was ligated and solutions of glucose, varying in concentrations from 5 to 46%, were introduced into the stomach and allowed to remain for a period of from 1 to 2 hours. Following this technic a mean recovery of 99.3% of the sugar introduced was obtained and there was no appreciable rise in the blood sugar level. They interpreted their results as demonstrating that glucose was not absorbed from the stomach in significant quantities.

In a series of experiments which we have conducted we have been unable to confirm the findings of Maddock, Trimble and Carey.[11]

In these experiments dogs varying in weight from 5 to 15 kilos and fasted for 24 hours were used. Sodium amytal anesthesia was used because it has less effect on the blood sugar level than other commonly used anesthetics, although we have found a slight but definite increase in the blood sugar level during a one-hour period of anesthesia. After the animal was placed on the table a sample of blood was taken from the femoral artery for determination of its sugar content. The determinations were made by the Folin-Wu[15] method. The animal was then injected with 50 mg of sodium amytal per kilo of body weight intraperitoneally. Samples of blood were removed at 30 and 60 minutes after the administration of the sodium amytal. One hour after anesthetization the abdomen was opened and the pylorus clamped with a heavy intestinal clamp, care being taken not to injure the blood supply to the stomach, either along the greater or lesser curvature. An incision was then made in the neck and the esophagus exposed and opened. A stomach tube was passed into the stomach through the esophageal opening and a ligature passed around the esophagus, fixing the position of the tube. The esophagus was also tied to the tube just below the diaphragm. The glucose solution was then introduced through a stomach tube, the tube washed free of glucose with water, and then clamped. In all the animals blood was removed every 15 minutes for determination of the sugar and the experiment terminated one hour after the introduction of the glucose.

Bacto-dextrose (Difco) was used for every experiment, the concentrations varying from 5.9 to 47.1%. The amount of fluid introduced varied from 200 to 300 cc. The sugar determinations on the introduced and recovered solutions were made by the Benedict method.[16]

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TABLE I.

Changes in Concentration and Volume of Glucose After Introduction in the Stomach with the Change in Blood Sugar.

Dog	Wt,	Amt of glucose in			Amt of glucose out, 1 hr			Loss	Blood sugar	
									1 hr after Amytal,	1 hr after Glucose,
No.	kilo	cc	%	g	cc	%	g	g	mg %	mg %
1	12.0	200	47.1	94.2	240	29.5	70.8	23.4	83	250
2	16.0	200	45.0	90.0	240	32.8	78.7	11.3	92	122
3	5.6	220	44.6	98.1	240	31.3	75.1	23.0	84	202
4	15.0	200	43.3	86.6	270	27.7	74.8	11.8	—	—
5	6.3	220	41.7	91.7	220	33.6	73.9	17.8	104	212
6	14.0	225	40.5	91.1	285	29.2	83.2	7.9	100	133
7	6.8	220	40.4	88.9	250	32.7	81.8	7.1	93	133
8	13.3	220	15.0	33.0	250	12.6	31.5	1.5	83	86
9	9.6	300	14.9	44.7	305	13.6	41.5	3.2	121	131
10	14.5	230	6.8	15.6	275	5.5	15.1	0.5	90	86
11	15.0	200	6.1	12.1	215	5.5	11.8	0.3	71	86
12	14.8	200	5.9	11.8	210	5.5	11.6	0.2	93	104

At the completion of each experiment the stomach and esophagus were excised, the contents carefully emptied and the mucous membrane carefully washed. The washings were added to the contents which had been removed.

The final dilutions before determination by the Benedict method[16] were such that the titer of the recovered solutions approximated that of the original solutions. No allowance was made for any possible loss of sugar by bacterial action since it had previously been demonstrated by Cori[17] and confirmed in this laboratory that this action is insignificant.

In 7 dogs the concentrations of glucose introduced into the stomach varied from 40.4 to 47.1%. The increase in volume of the recovered contents did not account completely for the reduction in the concentrations of the recovered solutions. There was constantly a loss of glucose, the minimum and maximum amounts being 7.1 and 23.4 g respectively (Table I).

In 2 dogs solutions of approximately 15% glucose were used. In each instance evidence was obtained that a small amount of glucose was absorbed.

Approximately isotonic solutions were used in 3 dogs. In these experiments the changes in concentration and in the total amount of glucose recovered at the end of an hour were so slight that they fall within the range of the experimental error.

In general the peripheral venous blood showed a rise in the blood sugar level whenever an appreciable quantity of glucose was absorbed.

Our data are not in agreement with those of Maddock, Trimble and Carey,[11] who reported that regardless of the concentration of the glucose used absorption from the stomach did not occur.

It may be that interference with the gastric blood supply at the pylorus, which can easily be damaged, may account for the differences obtained by different investigators.

From an analysis of our data we conclude that the absorption of glucose from the stomach bears a relationship to the concentration of the glucose solution used, volume remaining approximately constant.

The rise of the blood sugar level when markedly hypertonic solutions were used is further indication of the fact that the glucose which was lost from the gastric contents was actually absorbed.

Conclusions. Glucose is absorbed from the stomach when present in high concentrations. The rate of absorption would seem to bear a relationship to the concentration of the solution in the stomach.

17 Cori, C. F., *J. Biol. Chem.*, 1925, **66**, 691.