

days. The clinical manifestations of the infection in gophers were as severe, if not more so, as in guinea pigs. The pathology was essentially similar, although jaundice was not as readily discernible in the gopher as in young white guinea pigs.

Successful passage of the disease was also effected when gophers, dying or dead of the spirochetal infection, were permitted to remain in a cage with normal gophers. Under these circumstances, the normal animals ate portions of the infected animals, thereby contracting a fatal infection.

No change in the virulence of the organisms was revealed on testing in guinea pigs, after 15 serial passages in gophers.

Summary. Evidence is presented of the susceptibility of the gopher or Richardson ground-squirrel, *Citellus richardsonii* (Sabine), to the etiological agent of Weil's disease, *Leptospira icterohemorrhagiae*. Two series of 5 and 15 passages through gophers, respectively, were effected by the parenteral introduction of blood or tissue-suspensions. The organisms were tested in guinea pigs following the serial passages in gophers; no changes in pathogenicity were noted. Passage was also accomplished by permitting normal gophers to feed on infected gophers, dying or dead of the spirochetal disease.

The findings presented in this note suggest that gophers, or similar wild rodents, might act in nature as hosts for *Leptospira icterohemorrhagiae*.

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Rate of the Flow of Bile. Experimental Data on the Rabbit.

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Incidental to investigations on the function of the gallbladder the writer and his coworkers¹⁻⁴ accumulated data relative to the amount of bile produced by the rabbit. Information obtained under similar

¹ Halpert, B., and Hanke, M. T., *Am. J. Physiol.*, 1929, **88**, 351.

² Halpert, B., and Hanke, M. T., *Am. J. Physiol.*, 1932, **100**, 433.

³ Halpert, B., Thompson, W. R., and Marting, F. L., *Am. J. Physiol.*, 1935, **111**, 31.

⁴ Halpert, B., O'Connor, P. A., and Thompson, W. R., *Am. J. Physiol.*, 1935, **112**, 383.

experimental conditions as to the quantity of bile produced per hour per kilo of body weight in a large number of rabbits has not previously been reported. For this reason, the accumulated data are presented here in some detail.

Method. In each experiment the animal was anesthetized with ether and a glass cannula was tied into the common bile duct close to its termination in the duodenum. In the first series of experiments, a short rubber tube connected the glass cannula with a graduated pipette of 1 cc capacity and the bile was collected in 1 cc quantities. In the second series, the cannula was joined with a rubber tube to the inlet of a glass trap and the bile was collected over successive intervals of one-half hour. In the third series, the bile was similarly obtained but was collected against a hydrostatic pressure of 50, 75, and 100 mm respectively, greater than that of the atmosphere. The duration of the collections was from 2 to 6 hours.

TABLE I.
Volume of Bile Obtained from Ductus Choledochus of the Rabbit.

Rabbit No.	Rabbit Kg	1st hr ml	2nd hr ml	per kg ml/hr	3rd hr ml	4th hr ml	per kg ml/hr	5th hr ml	6th hr ml	per kg ml/hr
I-4	2.9 —	10	6	2.76	—	—	—	—	—	—
I-8	2.3 ♂	9	4	2.82	—	—	—	—	—	—
I-46	2.5 —	7	5	2.40	—	—	—	—	—	—
M-17	2.8 ♂	7	5	2.14	—	—	—	—	—	—
I-28	3.9 —	16	18	4.35	17	—	—	—	—	—
I-47	2.1 —	12	10	5.24	7	—	—	—	—	—
I-48	2.2 —	11	11	5.00	8	—	—	—	—	—
I-30	2.7 —	5	5	1.85	10	—	—	—	—	—
I-6	2.8 ♂	10	7	3.03	6	5	1.96	—	—	—
I-7	2.5 —	10	8	3.60	6	5	2.20	—	—	—
M-15	2.4 ♂	5	3	1.66	3	3	1.25	—	—	—
I-20	2.4 —	10	10	4.16	9	11	4.16	9	—	—
I-17	3.7 —	10	9	2.56	10	10	2.70	10	—	—
I-25	2.3 ♀	17	12	6.30	12	13	5.43	14	—	—
M-4	2.5 ♂	9	7	3.20	6	4	2.00	5	—	—
M-20	3.2 ♂	5	4	1.40	4	2.5	1.01	2.5	—	—
I-29	2.9 ♂	3	3	1.03	3	2	0.86	2	—	—
I-14	3.4 —	13	17	4.41	12	11	3.38	9	8.	2.50
I-23	3.1 —	10	8	2.90	6	8	2.25	5	6.5	1.85
I-32	2.8 ♀	10	9	3.39	8	5	2.32	4	3.	1.25
I-31	2.5 ♀	9	6	3.00	6	6	2.40	8	8.	3.20
I-34	2.6 ♂	9	4	2.50	5	3	1.53	2.5	2.5	0.96
I-16	2.6 —	6	4	1.92	6	6	2.30	6	6.	2.30
I-5	2.6 ♂	8	7	2.88	9	7	3.07	9	9.	3.46
M-18	2.6 ♂	6	3.5	1.82	3.5	3.5	1.34	4.5	4.	1.63
I-33	2.5 ♂	5.5	3.5	1.80	3.5	3	1.30	3	3.5	1.30
I-1	2.5 ♂	5.5	6.5	2.40	7	7	2.80	7.5	7.	2.90
I-2	3.1 ♂	15.5	13.5	4.67	8	8.5	2.66	9.5	9.5	3.06
I-3	2.5 ♀	8.5	6.5	3.00	7.5	6.5	2.80	4.5	5.5	2.00
Mean		9.0	7.4	3.04	7.3	6.2	2.29	6.4	6.0	2.20
a. d.		2.5	2.9	0.96	2.4	2.5	0.76	2.7	1.9	0.70

Experimental Data. In the first series of experiments (Table I), the mean flow of bile per hour per kilo of body weight was 3.04 cc with an average deviation of 0.96 during the first 2 hours (29 rabbits), 2.29 cc with an average deviation of 0.76 during the second 2 hours (21 of the 29 rabbits), and 2.20 cc with an average deviation of 0.70 in the third 2 hours (12 of the 29 rabbits).

In the second series of experiments (Table II), the mean flow of bile per hour per kilo of body weight was 4.00 cc with an average deviation of 1.12 during the first 2 hours (18 rabbits), 3.27 cc with an average deviation of 0.67 in the second 2 hours (12 of the 18 rabbits), and 2.64 cc with an average deviation of 0.47 in the third 2 hours (7 of the 18 rabbits).

TABLE II.
Volume of Bile Obtained from Ductus Choledochus of the Rabbit.

Rabbit No.	(Males) Kg	1st hr ml	2nd hr ml	per kg ml/hr	3rd hr ml	4th hr ml	per kg ml/hr	5th hr ml	6th hr ml	per kg ml/hr
L-11	2.9	9.9	6.2	2.77	—	—	—	—	—	—
C-9	2.5	6.0	6.1	2.42	7.5	—	—	—	—	—
C-11	3.1	17.1	18.7	5.77	14.5	—	—	—	—	—
C-12	2.9	11.6	9.6	3.65	10.7	—	—	—	—	—
C-13	2.8	10.5	10.0	3.66	9.9	—	—	—	—	—
C-14	3.2	11.0	8.1	2.98	5.3	—	—	—	—	—
L-5	3.0	14.2	10.3	4.08	8.7	6.6	2.55	—	—	—
L-6	2.3	6.9	6.0	2.80	5.5	5.6	2.41	—	—	—
L-3	2.4	11.4	8.2	4.08	8.5	9.4	3.72	—	—	—
L-8	2.5	7.1	10.9	3.60	10.7	8.7	3.88	—	—	—
L-10	2.8	19.6	12.8	5.78	10.7	9.7	3.64	—	—	—
L-1	2.7	8.9	8.9	3.29	9.5	9.6	3.53	8.1	7.7	2.92
L-2	2.6	12.8	12.6	4.88	10.8	13.7	4.71	9.1	11.8	4.01
L-4	2.5	18.9	18.8	7.54	11.2	8.2	3.88	7.4	5.9	2.66
L-9	2.5	16.8	13.1	5.98	9.7	8.1	3.56	6.8	5.1	2.38
L-12	2.7	8.0	6.7	2.72	7.5	8.0	2.87	7.5	6.5	2.59
S-1	2.5	10.0	9.7	3.94	8.0	7.0	3.00	5.9	6.1	2.40
S-2	2.2	3.7	5.8	2.15	3.8	2.8	1.50	2.3	4.4	1.52
Mean		11.4	10.1	4.00	8.9	8.1	3.27	6.7	6.8	2.64
a. d.		3.5	2.9	1.12	2.0	1.8	0.67	1.5	1.4	0.47

The amount of bile obtained per hour per kilo of body weight in the first series of experiments was somewhat less than in the second. For this difference the method of collecting the bile may be partly responsible, though it is conceivable that the difference is within the usual limits of variation. Pooling the data of the first and second series of experiments, the mean flow of bile per hour per kilo of body weight was 3.4 cc with an average deviation of 1.02 during the first 2 hours (47 rabbits), 2.64 cc with an average deviation of 0.72 during the second 2 hours (33 of the 47 rabbits), and 2.36 cc with an average deviation of 0.61 during the third 2 hours of the experiments (19 of the 47 rabbits).

In the third series of experiments (Table III), in which bile was collected against a hydrostatic pressure greater than that of the atmosphere, the mean flow of bile per hour per kilo of body weight was 2.77 cc with an average deviation of 0.35 during the first 2 hours (13 rabbits) and 1.63 cc with an average deviation of 0.28 during the second 2 hours (7 of the 13 rabbits), when the pressure was 50 mm greater than that of the atmosphere. The mean flow of bile per hour per kilo of body weight during the first 2 hours of the experiment was 4.56 cc with an average deviation of 0.69 (4 rabbits), when the pressure was 75 mm, and 3.07 cc with an average deviation of 1.02 (6 rabbits), when the pressure was 100 mm greater than that of the atmosphere.

TABLE III.
Volume of Bile Obtained from Ductus Choledochus of the Rabbit.
Hydrostatic Pressure 50 mm.

Rabbit (Males) No.	Kg.	1st hr ml	2nd hr ml	per kg ml/hr	3rd hr ml	4th hr ml	per kg ml/hr
M-27	3.0	10.4	7.2	2.93	—	—	—
M-28	3.1	10.7	7.2	2.88	—	—	—
M-30	3.4	14.8	7.6	3.29	—	—	—
M-31	2.8	9.6	8.3	3.19	—	—	—
M-33	3.8	12.4	12.3	3.25	—	—	—
M-36	3.4	11.1	11.4	3.30	—	—	—
M-24	3.9	11.6	9.7	2.73	8.0	7.7	2.01
M-25	3.6	4.5	6.5	1.52	4.2	5.0	1.27
M-26	3.6	10.9	10.0	2.90	8.8	5.0	1.91
M-29	3.0	10.5	4.5	2.50	4.7	4.2	1.48
M-34	3.6	9.9	9.2	2.68	6.6	7.7	1.98
M-37	3.5	10.2	7.8	2.57	5.3	4.3	1.37
M-32	2.9	6.6	7.0	2.34	4.6	3.8	1.44
Mean		10.2	8.4	2.77	6.0	5.4	1.63
a. d.		1.5	1.7	0.35	1.5	1.3	0.28
Hydrostatic Pressure 75 mm.							
C-2	2.6	8.8	13.5	4.28	11.5	—	—
C-4	2.7	11.2	9.7	3.87	8.1	—	—
C-6	3.0	11.7	13.3	4.16	4.7	—	—
C-17	3.0	20.0	15.7	5.95	12.7	—	—
Mean		12.9	13.0	4.56	9.2	—	—
a. d.		3.5	1.7	0.69	2.8	—	—
Hydrostatic Pressure 100 mm.							
M-38	3.0	9.7	5.0	2.45	—	—	—
C-1	2.4	6.7	4.1	2.25	4.5	—	—
C-5	2.9	11.7	8.7	3.52	7.3	—	—
C-7	2.8	11.3	10.0	3.80	8.4	—	—
C-8	3.1	14.8	12.8	4.45	10.4	—	—
C 15	3.0	6.8	5.0	1.96	2.5	—	—
Mean		10.1	7.6	3.07	6.6	—	—
a. d.		2.4	2.9	1.02	2.5	—	—

Summary and Conclusions. From the data presented it is evident that there was considerable variation in the total amount of bile obtained in each animal. The mean flow of bile per hour per kilo of body weight was 3.4 cc in the first 2 hours in 47 rabbits, 2.64 cc in the second 2 hours in 33 of the 47 rabbits, and 2.33 cc during the third 2 hours of the experiments in 19 of the 47 rabbits. Thus there was a gradual decrease in the flow of bile as the experiments proceeded. This decrease was more marked in those experiments in which the bile was collected against a hydrostatic pressure greater than that of the atmosphere. During the entire period of each experiment the gallbladder was resorbing half the volume of its content per hour, *i. e.*, about 0.5 cc per hour per kilo of body weight,^{3, 4} hence the amount of bile actually produced per hour by each rabbit was greater than that recorded.

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Reducing Substances of the Normal Urine. I. Effects of Insulin Injection.

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This paper embodies a study of the effect of insulin injection upon the excretion of the reducing substances of the normal urine, with special regard to the fermentable fraction. The observations were made on dogs.

There are two articles in the literature pertinent to our subject. Salmon¹ finds that, in man, there is a correlation between the blood sugar level and the normal excretion of reducing substances in the urine. Van Creveld and Van Dam² eviscerated frogs, except for kidneys and ureters, cannulated the latter, and perfused through the renal artery a fluid similar to Ringer's solution. To the perfusion were added various concentrations of glucose, and the glucose concentration of the recovered perfusion fluid and of the artificial urine was determined by the micrometric method of Bang. They noted that as the concentration of glucose in the perfusion fluid was

¹ Salmon, U. J., *PROC. SOC. EXP. BIOL. AND MED.*, 1930, **27**, 823.

² Van Creveld, S., and Van Dam, E., *Nederland Tijdschr. Geneeskunde*, 1923, **66**, 11, 1498.