for 2 hours in the presence of reduced glutathione at a concentration of 1×10^{-2} M while lysis did not occur in the other portion which had not been treated with reduced glutathione. Thus addition of the sulfhydryl compound to the inactive adsorbed phage resulted in infection, virus multiplication, and cell lysis.

Summary. Although there is evidence to suggest that cell wall components play a role as receptors for phage attachment to the cell, the details of virus adsorption and the prerequisite conditions for infection are not clearly elucidated. In the experiments reported here, it has been demonstrated that phages of Groups A and C streptococci are inactivated by certain sulfhydryl reagents such as PHMB and mercuric ion. The results suggest that these agents did not prevent phage adsorption but rather affected some later step in infection. The inactivation of phage infectivity by the sulfhydryl reagents was reversed by the thiol compound reduced glutathione, a finding consistent with the view that sulfhydryl groups of the phage tail may play a role in the early stages of phage infection.

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Effects of Insulin on Renal Hemodynamics.* (28811)

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Intravenous administration of glucose elevates blood glucose and causes a significant rise in renal blood flow(1,2). To investigate whether renal blood flow might be correlated with blood sugar levels during hypoglycemia, Bounous and Shumacker injected insulin intravenously into anesthetized dogs(2). One-half unit of regular insulin per kg of body weight decreased renal blood flow gradually during 20 minutes to only 60% of the control value. Blood sugar fell from a mean of 77 mg % to a mean of 50 mg %. On the average, total urine flow fell from 0.04 to 0.02 ml per min. However, in one of the 6 experiments there was no detectable urine flow either before or after the insulin. Bounous and Shumacker ascribed the decrease in renal blood flow to the lowering of blood sugar produced by insulin.

In the experiments reported below, intravenous administration of 1.0 unit of regular insulin per kg of body weight produced no significant effect on renal blood flow and a slight, but probably significant, increase in urine flow.

Methods. Adult mongrel dogs were anesthetized with a barbiturate or with chloralose. The ureters were exposed retroperitoneally and cannulated so that separate urine samples could be collected from each kidney. Blood was obtained from a femoral artery. For measurement of glomerular filtration rate, creatinine, and for measurement of effective renal plasma flow, para-aminohippurate (PAH) were given by continuous intravenous infusion after a priming dose, and were determined in plasma and urine by methods described by Smith(3). Renal blood flow was calculated from the PAH clearance and the hematocrit, assuming an extraction ratio of 0.85. In addition, renal blood flow through one kidney was directly measured with a Shipley-Wilson rotameter in 3 of the 6 ex-

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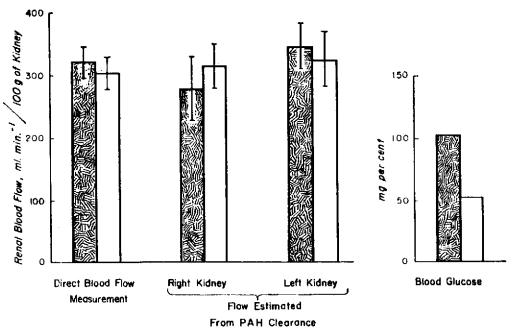

FIG. 1. Renal blood flow and blood glucose before and after intravenous administration of 1 unit of regular insulin per kg of body wt. Each shaded bar represents a mean value for all dogs during the 3 ten-min periods immediately before injection of insulin. Each open bar represents corresponding mean value during the 3 ten-min periods immediately after injection of insulin. Vertical lines at top of bars represent plus and minus one standard error of mean.

periments. Heparin was infused into the rotameter circuit at a rate of 2 mg/kg of body weight per hour. In 2 experiments the carotid artery flow was diverted through the rotameter and into the cannulated renal artery. In one experiment, the renal vein was catheterized from the femoral vein, and blood flowed through the rotameter to the jugular vein. Blood temperature and pressure in the circuit were monitored, and temperature was adjusted to approximately 37°C with an external heating tape. Femoral blood pressure was measured with a strain gauge. Blood glucose was determined by the Glucostat method (Worthington Biochemical). Insulin† was given as a single intravenous dose of 1 unit per kg of body weight.

Results. The results may best be summarized by comparing the mean values for the 3 ten-minute periods immediately before insulin with the corresponding mean values for the 3 ten-minute periods immediately after insulin. *Blood glucose* decreased progressively from a pre-insulin mean of 102 mg % to a mean of 34 mg % in the third post-insulin period, the mean for all 3 periods after insulin being 54 mg % (Fig. 1). In spite of this marked hypoglycemia, neither *renal blood flow* (Fig. 1) nor *glomerular filtration rate* (Table I) was significantly altered. *Urine flow* actually increased, slightly but significantly (Table I). We have thus been quite unable to confirm the decreases in renal blood flow and urine flow in response to insulin which were reported by Bounous and Shumacker. In an attempt to find conditions favorable to an effect of insulin upon renal blood flow, the anesthetic was varied, but the same negative results were obtained whether we employed thiopental, (the anesthetic used by Bounous and Shumacker), pentobarbital, or chloralose. Furthermore, the degree of hydration of the dog had no discernible influence upon the results.

Discussion. We are unable to account for the difference between our results and those of Bounous and Shumacker. It is worth noting that in most of our experiments, extensive surgery was not needed, and that urine flow prior to injecting insulin averaged 2.0 ml/min per 100 g of kidney. In contrast, the method of measuring renal blood flow used by Bounous and Shumacker necessitated ligating numerous abdominal veins. Furthermore, in their experiments urine flow was extremely low, even before insulin was administered.

In our experiments, renal blood flow, though in good accord with the values for normal dogs given by Smith(4), was on the average somewhat less than in the dogs studied by Bounous and Shumacker. To rule out the unlikely possibility that renal blood flow in our dogs was already minimal and could therefore not decrease further in response to insulin, the effect of an injection of epinephrine was tested at the end of the 3 experiments in which renal blood flow was being measured with a rotameter. One microgram of epinephrine injected into the renal artery caused a profound but transient decrease in blood flow, thus demonstrating that the renal vessels were indeed still able to respond to a sufficient stimulus. It is concluded that renal blood flow is not affected by the hypoglycemia caused by insulin.

Summary. Renal blood flow, glomerular filtration rate, and urine flow were measured before and after intravenous administration

† M-240 Regular Iletin (Insulin, Lilly), U.S.P., U-40, Lot No. 1117-785514.

TABLE I. Effect of Insulin Administration.

Dog	Side	Glomerular filtration rate, ml min^{-1}/100 g kidney			Urine flow, ml min^{-1}/100 g kidney		
		Before	After	Change	Before	After	Change
1	right	44	61	+17	2.6	3.0	+ .4
	left	66	82	+16	2.8	3.6	+ .8
2	right	64	58	- 6	.5	.4	- .1
	left	82	72	-10	.7	.5	- .2
3	right	70	81	+11	1.1	1.5	+ .4
	left	67	51	-16	.5	.3	- .2
4	right	58	54	- 4	4.2	5.8	+1.6
	left	39	38	- 1	4.5	5.1	+ .6
5	right	60	56	- 4	2.0	1.8	- .2
	left	40	58	+18	2.1	2.1	.0
6	right	60	60	0	1.6	2.5	+ .9
	left	56	55	- 1	1.5	2.1	+ .6
Mean		58.8	60.5	+ 1.7	2.0	2.4	+ .38
Standard error of mean				± 2.9			± .15
P*				>.5			<.05

* P = Probability of obtaining, by chance alone, a mean change with an absolute value as large as or larger than the observed mean change.

of insulin. Contrary to a previously published report, renal blood flow and glomerular filtration rate did not change though blood sugar levels fell to 30% of control levels. There was a slight, but probably significant, increase in urine flow following administration of insulin.

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