Glomerular Filtration Rate and Renal Plasma Flow During Mannitol Loading in Hydropenic Dogs. (18025)

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Data are presented on the glomerular filtration rate and renal plasma flow of hydropenic dogs before and during osmotic diuresis induced by mannitol loading.

Experimental. The experiments were performed on trained, unanesthetized animals maintained on a diet of commercial dog food and horse meat, deprived of water for 20 hours and of food for 16 hours prior to experimentation. A detailed description of the procedure will be published elsewhere(1). Clearances of creatinine and para-aminohippurate were determined for 2 periods prior to and for 6 periods after mannitol loading. The priming and maintenance doses of creatinine and sodium para-aminohippurate were administered intravenously in hypertonic solution. During the first 3 post loading periods plasma mannitol was maintained at about 30, and, during the last 3, at about 60 milliosmols per liter. The analytical methods have been described previously(2).

Results. The results of these experiments are given in Table I. For the sake of brevity only one pre-loading and 2 post-loading periods are listed. The data include concurrent time, urine flow, and the clearance of creatinine, paraaminohippurate, mannitol and urea.

Although urine flow increased as much as 28 fold after loading, no consistent change in creatinine clearance, renal plasma flow or filtration fraction occurred. The creatinine clearance increased in one experiment and diminished slightly in two, while the renal plasma flow increased slightly in all 3. None of the measurements changed by more than 15% of their preinjection value. The filtration fraction fell in 2 experiments and increased in a third.

The mannitol clearance ranged from 0.89 to 1.12 of the creatinine values.

The urea clearance increased markedly after loading. The ratio of urea to creatinine clearance during preliminary periods varied from 0.35 to 0.40, increasing to as much as 0.90 after loading. Similar ratios were obtained by Shannon(3) during osmotic diuresis.

TABLE I.
Clearance of Urea, Mannitol, Creatinine, and Para-aminohippurate Before and During Osmotic Diuresis Produced by Mannitol Loading.
The values are expressed in cc/min/M^2.

Period	Concurrent time, min.	Urine flow	C_{urea}	$C_{man.}$	$C_{creat.}$	C_{PAH}	F.F. $\frac{C_{creat.}}{C_{PAH}}$
		Dog Pe. 15.5 kg, 0.62M^2.					
P-2	—30 to —4	0.29	26.1		64.7	205	.32
	0 to 9	79 cc 25% Mannitol. Maintenance 0.95 cc/min.					
1	20 to 34	4.47	46.0	65.9	73.5	215	.34
2	34 to 49	4.78	47.5	73.6	78.5	251	.31
		Dog De. 16.6 kg, 0.64M^2.					
P-2	—32 to —5	0.30	28.9		82.4	267	.31
	0 to 11	106 cc 25% Mannitol. Maintenance 0.91 cc/min.					
1	14 to 28	8.63	49.9	72.6	79.3	273	.29
2	28 to 47	6.32	47.2	61.8	69.1	241	.29
		Dog Vi. 14.0 kg, 0.56M^2.					
P-2	—44 to —11	0.34	24.8		63.9	199	.32
	0 to 8	72 cc 25% Mannitol. Maintenance 0.92 cc/min.					
1	13 to 33	5.59	55.7	69.7	62.0	227	.27
2	33 to 52	4.95	45.0	60.5	54.6	207	.26

Discussion. Data in the literature are consonant with the present studies. The creatinine clearance of non-hydropenic dogs has been shown to be unaffected by the infusion of hypertonic glucose(3) or urea(4) solutions. Other studies(5) showed similar results with sucrose and mannitol loading. The renal plasma flow was not determined in the experiments cited.

Summary. Osmotic diuresis produced by mannitol loading in hydropenic dogs does not significantly affect the glomerular filtration rate, renal plasma flow or filtration fraction.

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Electron Microscope Studies on Structure of Mitotic Figure.* (18026)

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The structure of the amphiaster has long been a subject of debate [Wilson(1) and Schrader(2).] The majority of evidence covered in these reviews indicates that the spindle is composed of fibers. The electron micrographs presented here also show the fibrillar structures in the spindle. The terminology here used in reference to the spindle components is that recommended by Schrader (2).

Material and methods. The material is from a crayfish testis, actively forming germ cells. It was fixed in Bouin's solution, embedded in a mixture of 60% paraffin (melting point, 70°C) and 40% beeswax and sectioned at 0.5μ with a Spencer No. 820 microtome equipped with a Spencer thin section adapter. The electron microscope used was an R.C.A. model E.M.U. equipped with an unbiased gun. The magnification of the figures may be determined from the micron scale appearing on each figure.

We wish to emphasize that since the cells here studied were fixed and dried the element of artifact must be kept in mind in analyzing the pictures.

Results and discussion. A portion of one-half of a longitudinal section of a metaphase spindle is shown in Fig. 1. The shape of the mitotic figure is typical of that seen in the usual preparations studied by the light microscope. The "chromosomal fibers" are about 1500-2500 Å in width. The fiber on the right side of the figure appears to be split, suggesting that the large spindle fibers in the crayfish are compound. Further evidence that the fibers are compound, *i.e.*, composed of many smaller fibers, is illustrated in Fig. 4, 5 and 8. The tangential section of the large "chromosomal fibers" in Fig. 4 clearly shows the cut ends of the smaller fibers within the compound larger ones. In addition, an apparent lateral stretching of the large "chromosomal fibers" has separated their small component fibers, in Fig. 5 and 8. The smaller fibers are about 300-600 Å in width. Some of the smaller fibers show irregular banding or beading which possibly is the result of irregular contraction at the time of fixation. Similar phenomena may also be

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1. Wilson, E. B., *The Cell in Development and Heredity*, p. 114, Macmillan Co., N.Y., 1928, 3rd edition.

2. Schrader, F., *Mitosis*, Columbia University Press, N.Y. 1944, p. 4.