

taining the micrococcus when it is injected subcutaneously. Filtrates of the micrococcus culture do not appear to inhibit the oral infectivity of the virus. It is suggested that the M-H virus may have been absorbed on the *Micrococcus varians* organism, and is thus

not as readily available for invasion through the intestinal tract or that the virus itself may have been modified so that its oral infectivity has been reduced while its infectivity by subcutaneous inoculation is unchanged.

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Allantoin Clearance as a Measure of Glomerular Filtration Rate in Man.*

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In a recent study,¹ the renal clearance of allantoin in the rat and dog was found to be equal to that of creatinine. This equivalence held true despite variations in both urine flow and plasma concentration of allantoin. It seemed probable therefore that the clearance of allantoin could serve as a measure of glomerular filtration rate in these two species. Furthermore, it seemed possible that the clearance of this same substance might serve as a measure of glomerular filtration rate in man. Therefore it was thought advisable to determine the renal clearance of allantoin in normal human subjects.

Methods. Five normal men and one woman received 10 g of allantoin dissolved in 500 cc of fresh orange juice by mouth at 8:00 A. M. on the day of the experiment. Each subject was kept at bed rest until 9:30 A. M. at which time they were catheterized and given 1000 cc of H₂O by mouth. At 10:00 A. M., the bladder was emptied, washed out with normal saline solution, a blood sample taken and the first urine collection begun. At 10:30 A. M., the bladder was emptied again, washed out with saline solution, and a second blood sample was obtained. The second urine collection began immediately after the bladder had been emptied and washed. At 11:00

A. M., the second and final collection period was terminated, and a third blood sample was obtained.

Urine and plasma samples were analyzed for allantoin by the method of Christman, Foster and Esterer,² modified as described in a previous study.³

The allantoin clearance of each subject then was calculated as an average of the clearances obtained for the 2 collection periods and corrected to 1.73 square meters of surface area.

Results. As Table I indicates, the allantoin content of plasma, 120, 150 and 180 minutes after oral ingestion of 10 g of this substance remained approximately constant. The average stability of the plasma allantoin during the entire clearance study of course eliminated any need for supplementary oral or parenteral administration of allantoin.

The average plasma allantoin clearance of the 6 subjects was found to be 123 cc per minute (See Table I). Individual clearances varied from 107 to 137 cc per minute. It should be mentioned that no ill effects were observed in any patient during or after the clearance study.

Discussion. Similar to the results obtained in the rat and dog,¹ the present study indi-

* Aided by a grant from the U. S. Public Health Service.

¹ Friedman, M., and Byers, S. O., *Am. J. Physiol.*, to be published.

² Christman, A. A., Foster, P. W., and Esterer, M. B., *J. Biol. Chem.*, 1944, **155**, 161.

³ Byers, S. O., Friedman, M., and Garfield, M. M., *Am. J. Physiol.*, to be published.

TABLE I.
The Renal Clearance of Allantoin in Human Subjects.

Patient	Age, yr	Avg urine flow (cc/min)	Plasma allantoin conc. (mg/100 cc)			Renal allantoin clearance (cc/min)		
			10:00	10:30	11:00	Per. I	Per. II	Avg
W.J.	45	13.45	7.4	7.0	7.5	101	113	107
H.B.	22	3.70	6.1	7.1	6.8	124	136	130
G.C.*	43	10.00	5.5	5.1	4.3	134	140	137
H.S.	43	5.70	6.9	7.7	8.8	132	114	123
R.S.	42	5.20	5.3	4.4	5.1	115	114	127
D.C.	32	5.90	4.3	4.3	4.8	131	123	115
Avg		7.33	5.9	5.9	6.2	123	123	123

* Female.

cates that the clearance of allantoin probably measures the rate of glomerular filtration in man. Thus, the average allantoin clearance obtained in the 6 subjects (123 cc per minute) is approximately the same as the value found for the inulin clearance (123 cc per minute) in man by Smith, Goldring and Chasis⁴ and by one of us (M.F.) in a previous study.⁵

Conclusion. The average renal clearance of allantoin in 6 normal human subjects was found to be 123 cc per minute. The similarity of this value to that now accepted for the renal clearance of inulin (a glomerular filtrate without tubular reabsorption) strongly suggests that the renal clearance of allantoin is at the level of glomerular filtration.

⁴ Smith, H. W., Goldring, W., and Chasis, H., *J. Clin. Invest.*, 1938, **17**, 263.

⁵ Friedman, M., Selzer, A., and Rosenblum, H., *J. A. M. A.*, 1941, **117**, 92.

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Effect of Folic Acid* and Bis (β -Chloroethyl) Sulfide (Mustard Gas)[†] on Transplanted Mouse Lymphosarcoma.[‡]

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Leuchtenberger *et al.*^{1,2} have shown that folic acid is a tumor growth inhibitor for sarcoma 180 and for spontaneous mammary

tumors in mice. Bass and Freeman³ were not able to demonstrate a similar regression in transplanted lymphoma 6C₃HED in mice. The present investigation was designed to further study the effect of folic acid on the 6C₃HED tumors, when administered alone or in combination with bis (β -chloroethyl) sulfide. It was hoped that the folic acid might reduce the severity of the toxic side effects of bis (β -chloroethyl) sulfide. Although this did not prove to be the case, certain interesting observations were made which are reported in this paper.

* The "synthetic folic acid," "Folvite," and "Teropterin" used were supplied by Lederle Laboratories, Pearl River, N.Y.

[†] The bis (β -chloroethyl) sulfide was supplied by Edgewood Arsenal, Md.

[‡] These studies have been made with the assistance of a grant-in-aid from the National Cancer Institute.

¹ Leuchtenberger, C., Lewisohn, R., Laszlo, D., and Leuchtenberger, R., *Proc. Soc. Exp. Biol. and Med.*, 1944, **55**, 204.

² Leuchtenberger, R., Leuchtenberger, C., Laszlo, D., and Lewisohn, R., *Science*, 1945, **101**, 46.

³ Bass, Allan D., and Freeman, Marion L. H., *J. Nat. Cancer Inst.*, 1946, **7**, 171.