

killed after 2 weeks. Thirteen nephrectomized animals were injected either once on the day after the operation or on the second and fifth day with autopsy on the fourteenth day.

Transverse sections were taken through the middle of the kidney and the number of the mitoses per section determined. The influence of the intraperitoneal injection is shown in the figure. Seven normal rats with one injection had an average of 4 mitoses per section and 8 with 2 injections had an average of 7.6 as compared with 0.75 in 50 normal untreated animals. In a second series the mitotic rate was tripled by the injections with an average of 10 in the nephrectomized and 30 in the injected nephrectomized. At this time we have determined only that the parenteral introduction of the whole cell under the conditions of the experiments increases the mitotic rate of the tubular epithelium.

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Absorption of Drugs from the Esophagus.

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While studying the effect of acute esophageal obstruction in the dog,¹ it was noted that the production of a closed loop of the esophagus was invariably fatal. Although post mortem evidence indicated that death was due to an aspiration pneumonia or to rupture of the loop with subsequent pleuritis and mediastinitis, the possibility of toxin absorption from the esophageal loop was considered. The following experiments were performed to ascertain the absorptive ability of the esophagus under various conditions.

Dogs were used. Under sodium pentobarbital anesthesia, a closed loop of the esophagus was prepared by ligating the esophagus in the neck and in the thorax just above the diaphragm. The substances to be tested were introduced into the lumen of the esophageal loop and the absorption estimated either by chemical tests of the urine and saliva, or by observation of the characteristic physiological effects.

Five experiments were performed in each group. Potassium iodide (in 10% solution), sodium ferrocyanide (in 10% solution), and sodium nitrite (in 5% solution) were all slowly but definitely

¹ Dragstedt, C. A., and Mullenix, R. B., *Arch. Surg.*, 1932, **24**, 152.

absorbed under the conditions of these experiments. Histamine hydrochloride (in doses up to 3 mg. per kilo), strychnine sulphate (in doses up to 5 mg. per kilo), cocaine hydrochloride (in doses up to 15 mg. per kilo), ephedrine hydrochloride (in doses up to 10 mg. per kilo), nicotine (in doses up to 2 mg. per kilo), and epinephrine hydrochloride (in doses up to 10 mg. per kilo) were not sufficiently absorbed to produce characteristic effects. Phenolsulphonphthalein, methylene blue, and antipyrine were not sufficiently absorbed during the course of 2 hours to be detected in the urine. Distention of the esophageal loop with air pressure up to 60 mm. of mercury after introduction of the above drugs which were not normally absorbed, caused various reflex disturbances of respiration and blood pressure, but did not apparently facilitate absorption. After irrigating the esophageal loop with 50% alcohol, followed by tap water to wash out the alcohol as completely as possible, definite absorption of histamine, strychnine, cocaine, ephedrine, nicotine, and epinephrine was shown. Histamine hydrochloride in doses of 2 mg. per kilo produced an average fall of blood pressure of 30 mm. of mercury in an average time of 15 minutes. Strychnine sulphate in amounts of 1 mg. per kilo produced marked excitability in 3 cases, and convulsions with fatal ending in 2. Ephedrine hydrochloride in amounts of 5 mg. per kilo produced an average rise of blood pressure of 50 mm. of mercury in an average time of 20 minutes. Nicotine in amounts of 2 mg. per kilo produced death in all cases. Epinephrine hydrochloride in amounts of $\frac{1}{2}$ mg. per kilo produced an average rise of blood pressure of 30 mm. of mercury in an average time of 20 minutes.

Distention of the esophageal loop previously irrigated with alcohol with air pressure after introduction of the last group of drugs in general decreased the time necessary to elicit the characteristic effects. For example, the pressor responses after epinephrine developed within one minute when air pressure was used. The increased absorptive ability of the esophagus after irrigation with alcohol gradually decreased with time, to be gone in the majority of cases in 3 hours.

Mammaser and Boyd² have noted increased absorption of histamine from the intestine after irrigation with alcohol. Inactivation of histaminase may be considered a factor here. This does not seem a probable factor in the case of the esophagus as, so far as we know, histaminase has not been shown to be present in the esopha-

² Mammaser, L. F., and Boyd, T. E., *PROC. SOC. EXP. BIOL. AND MED.*, 1929 **26**, 765.

gus and its absence in the stomach³ might be considered as indicating that it is not present in the esophagus. The increased absorption of strychnine, epinephrine, nicotine and ephedrine could not be explained on this basis. The increased absorption after alcohol irrigation may be due to removal of mucin. This does not appear to be the case as reintroduction of considerable mucin either with the drugs used or for some interval before introduction of these drugs did not appreciably diminish their absorption. There was no apparent adsorption of the drugs by the mucin. The mucin normally present prior to alcohol irrigation may, however, be distributed so as to act as a mechanical barrier which is not adequately reconstructed by introducing mucin.

Macht⁴ has related the low absorbability of the esophagus as compared with the stomach to the histological types of their mucosae.

From our results and those of Macht, it is apparent that the absorptive ability of the esophagus is normally poor, that it is not increased by distention, but that it may be considerably increased by such procedures as lavage with alcohol.

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Leucocyte Counts and Bacteremia Studies in Rats Orally Immunized Against Pneumococci.

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Various experimenters¹ have shown that young rats can be vaccinated *per os* against multiple lethal doses of virulent pneumococci. Ross has shown that the blood serum of such orally immunized animals contains antibodies which may be demonstrated by means of the passive immunity conferred upon other animals to which it is transferred. Besides this indication of a general humoral resistance to infection, we have seen no attempts at explanation of the mech-

³ Best, C. H., and McHenry, E. W., *J. Physiol.*, 1930, **70**, 23.

⁴ Macht, D. I., *J. Pharm. and Exp. Therap.*, 1923, **22**, 123.

¹ Killian, H., *Z. f. Hyg. u. Inf.*, 1924, **102**, 279. Eguchi, C., *Ibid.*, 1925, **105**, 74. Kimura, R., *Ibid.*, 1927, **107**, 390. Ross, V., *J. Immunol.*, 1926, **12**, 219. Maëji, Y., *Acta Scholae med. univ. imp.*, Kyoto, 1929, **12**, 295.