successive 10 cc. portions of absolute alcohol, filtered, evaporated to dryness, taken up in 4 cc. of water and color developed as described. Readings can best be made at the end of 10 minutes.

We have had the opportunity of applying the method to the blood and pleural fluid of a case of chronic nephritis, with a blood creatinine of 24 mg. and a urea N of 162 mg. per 100 cc. The color reaction indicated 10 mg. of methylguanidine in the former and 15 mg. in the latter. In a case of hypertension without nitrogen retention the test indicated 10 mg. per 100 cc. Tests on the blood of normal subjects indicate that, if methylguanidine is present, the amount is less than 0.2 mg. per 100 cc.

Bearing in mind that this color reaction is not entirely specific for guanidine bases, it would appear that either guanidine bases are present in estimable quantity in nephritic blood or some unknown substance is present which gives the reaction. The results could not have been due to urea or creatinine since no appreciable interference was noted in controls which contained comparable quantities of both substances.

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A new adsorbent for creatinine.

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The use of kaolin in removing creatinine from dilute solution is disadvantageous in that the adsorbed creatinine cannot be released again for identification. An adsorbing agent which can be decomposed under conditions that will not destroy creatinine therefore appears desirable.

If one adds to 10 cc. of the strongest creatinine standard for blood determinations (1 mg. of creatinine in 100 cc. of saturated picric acid), 0.1 cc. of 9.5 per cent potassium chloride, and 1 cc. of 10 per cent phosphotungstic acid, a finely divided yellow precipitate forms, which settles out very slowly, but can be centrifuged out quickly. The supernatant liquid is decanted, and the

precipitate suspended in 10 cc. of saturated picric acid. On adding 1 cc. of 10 per cent sodium hydroxide, the precipitate dissolves and the color developed matches that of 10 cc. of the same standard, made alkaline directly with the same amount of sodium hydroxide. Controls with the potassium precipitate in absence of creatinine are negative.

Complete adsorption of creatinine is practically coincident with appearance of the precipitate. Supersaturation is occasionally encountered. If the precipitate fails to appear, the difficulty is overcome, when working with larger amounts, by adding a drop of potassium chloride solution after the phosphotungstic acid. The precipitate is more difficult to centrifuge out if all of the potassium chloride is added after the phosphotungstic acid.

The precipitate obtained from a liter of saturated picric acid containing 10 mg. of creatinine, on adding 10 cc. of 9.5 per cent potassium chloride, and 100 cc. of 10 per cent phosphotungstic acid, can be suspended in the centrifuge tube in which it has been collected, in 30 cc. of normal sulfuric acid. On diluting the mixture to about 50 cc. and shaking with ether, an emulsion forms, which separates on a moment's centrifuging into three sharp layers, predominantly ether, sulfuric acid, and phosphotungstic acid solutions. The latter contains undecomposed precipitate at first. The ether layer is siphoned off, and the shaking repeated with eight or ten fresh portions of ether until all of the picric acid has been removed. The middle layer is then siphoned off. It contains over 80 per cent of the creatinine. Sulfuric and a trace of phosphotungstic acid are removed with basic lead acetate solution. The excess of lead is removed with hydrogen sulfide, and the filtrate evaporated. A residue of potassium acetate and creatinine remains. This can be transferred to a tube with 10 cc. of absolute alcohol in small portions, and most of the potassium is precipitated by additions of concentrated hydrochloric acid until a drop removed with a stirring rod and placed on wet congo paper gives a blue color. After centrifuging and decanting, the alcoholic solution is evaporated, and the residue transferred to a small test tube with portions of water totalling 10 cubic centimeters. Colorimetric analysis shows presence of about 7 mg. of the original 10 mg. of creatinine. Dry picric acid, 130 mg., is now added, and the tube heated. On cooling, potassium creatinine picrate crystallizes out, only 0.4 mg. creatinine remaining in solution. After centrifuging and decanting the

liquid, the picrate can be recrystallized in the same tube from 3 cc. of water, washed with a similar quantity of absolute alcohol, then with ether, and dried. It is tested for purity by weighing 10 mg. accurately, and determining the creatinine content colorimetrically.

If phosphotungstic acid in the above amounts is added to saturated picric acid filtrates from blood or pleural transudate, a precipitate forms, which, if the blood is not oxalated with potassium oxalate, is not due to potassium ion. A large amount of the substance giving the Jaffé reaction is adsorbed. The residue, on evaporation after hydrogen sulfide treatment in the above scheme, can be taken up directly in water, and saturated with picric acid in the manner described. On cooling this picric acid solution of the residues from 400 cc. portions of postmortem blood from two nephritics, no precipitate formed. The same finding held for fluid from the pleural cavity, exudate in one case and transudate in the other. But on addition of potassium chloride, creatinine potassium picrate crystallized out of all of the picric acid solutions easily, and was purified and identified as above. The samples contained 18.2 to 18.7 per cent creatinine (theory 18.5), and a solution of the same lost its creatinine on treatment with kaolin.

Unfortunately the potassium precipitate adsorbs creatine also. When amounts of creatine varying from 20 to 100 mg. (as creatinine) were added to a liter of saturated picric acid containing 10 mg. of creatinine, the additional creatinine in the final residue increased steadily, in each case corresponding to about 22 per cent of the creatine present. Whether the precipitate produced on adding phosphotungstic acid to picric acid filtrates from the fluids examined adsorbs creatine cannot be decided at present. In the decomposition, the sulfuric acid layers, according to colorimetric methods, contained far too little creatine to account for the creatinine potassium picrate isolated, and the substance responsible disappeared in the basic lead acetate precipitation.

The "creatinine" content of both of the bloods studied was essentially the same as on repeated examination before death. The fluid from the pleural cavity gave values almost identical with those of the blood samples, which contained 5.9 and 24.0 mg. respectively, but fully half of the "creatinine" of the pleural transudate and exudate was removable by kaolin. Further study

of this point may be of interest, both in connection with the question of presence of creatinine in blood, and with the site of formation.

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A study of interrupted duodenal obstruction in the rabbit.

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The obstruction was produced, 20 cm. below the pylorus, by means of a ligature tied over an elastic compressor on the outside of the abdominal wall. Such an obstruction causes almost no trauma to the intestine, and can be released at any time desired without employing a second anesthetic and laparotomy, with their complicating effects.

If the obstruction at this level is not released, the period of survival averages seventeen hours. The variations from this average time are within three hours.

If the obstruction is released after a duration of fifteen hours or less, the animal survives. If, however, the obstruction is released after a duration of sixteen hours or more, the animal does not survive.

The sharp line of demarcation between the duration which is fatal, and that which is followed by recovery is quite striking. Also, the recovery of the animals from an obstruction of twelve to fifteen hours duration was remarkably rapid. Even though such animals before release of the obstruction gave evidence of being in a very serious condition, a striking degree of recovery is shown within one to three hours following the release of obstruction. If the animal's condition was due to absorption of a highly toxic substance from the obstructed content, such rapid recovery would hardly be expected. If the condition were due, however, to depletion of chloride[1] or the loss of fixed base,[2] the rapid

[1] Hayden, R. L., and Orr, T. G., *J. Exp. Med.*, 1923, xxxvii, 365.

[2] Gamble, J. L., and McIver, Monroe A., PROC. SOC. EXP. BIOL. AND MED., 1925, xxii, 365.