

effect of activity of the alimentary apparatus upon the excretion of endogenous uric acid. To this end a comparison was made of the hourly uric acid excretion during a fasting condition and that when the digestive glands had been stimulated in various ways. The succagogues employed were pure nutrients—protein, fat and carbohydrate and combinations of these—pilocarpine and alcohol. In addition the effect of the laxatives phenolphthalein, castor oil and Epsom salt was investigated. These may act either by increasing peristalsis or the secretion of water into the intestine, or both, according to the laxative employed and the amount. The action of atropine under conditions where a secretion of digestive juices would be expected—after the ingestion of food—was studied and an experiment was carried out to obtain some light on the rôle of muscular work in the excretion of uric acid.

The results of the investigation show that activity of the digestive glands, initiated by the foods mentioned or pilocarpine, is attended by an augmented excretion of uric acid. The laxatives showed no influence on the excretion of uric acid even when agar agar was taken previously for the purpose of increasing the mechanical work of the intestine. Neither did alcohol or muscular exercise. Atropine inhibited the rise which normally follows the ingestion of the food-stuffs taken subsequent to the atropine.

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### **The mechanism of the action of anti-pneumococcic serum.**

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A year ago it was observed that an intravenous injection of a small amount (0.2 c.c.) of immune serum causes the disappearance, within ten minutes' time, of the bacteria from the blood of a rabbit having a pneumococcic septicæmia. It was decided to investigate the above phenomenon in the hope of ascertaining, if possible, the manner of action of anti-pneumococcic serum.

In the light of our results concerning the behavior of typhoid bacilli in the circulation of normal rabbits, we believed it possible

that whole rabbit blood plus immune serum killed the pneumococci. Therefore rabbit blood was taken in hirudin; varying amounts of immune serum were added to the hirudin blood; definite quantities of bacteria were added and plates made immediately after starting the experiments, and at intervals for twenty-four hours. The colonies were found much reduced in the tubes containing the immune serum and whole blood, but after twenty-four hours all tubes were "saturated" with bacteria. It was believed that the immune serum plus whole blood produced great reduction in the number of bacteria, but could not cause sterilization.

Later it was deemed advisable to follow with the microscope the processes occurring in the tubes. To our surprise, we found that the bacteria were agglutinated in tubes containing serum in a dilution of 1-500; macroscopically the agglutination titre is 1-80. Thus it appeared that the reduction of colonies was due to the clumping.

It was then surmised that the disappearance of the bacteria from the circulating blood of the rabbit following the injection of immune serum might be due to clumping *in vivo* and filtration by the capillary systems of the organs. Our investigation of this point gave the following results:

When a rabbit with pneumococcic septicemia is given 1 c.c. of immune serum intravenously, the cocci are clumped within forty seconds' time and after two minutes they have left the circulation. We have found the clumps in the heart's blood. Next, fragments of the organs—lungs, spleen, liver, kidney, brain, etc.—were crushed and examined, and clumps of pneumococci were found in all. The fate of the clumps was then investigated. By killing the animals at various times after the administration of the serum, it was observed that the polymorphonuclear leucocytes englobed and digested them. The fixed cells play a small part also. Sectioned and crushed tissues gave the same results. Pneumococci from 150 c.c. of bouillon are thus destroyed within two to three hours. The smallest amount of serum that will influence the infection causes the clumping *in vivo*.

Typhoid bacilli, dysentery bacilli, streptococci, staphylococci, and gonococci have been tested for agglutination *in vivo* and all behave in a manner similar to the pneumococci, that is, they

agglutinate in less than one minute's time. Cross-agglutination of the different types of pneumococci was tested and in no case did a heterologous serum cause any clumping. One cubic centimeter of serum per kilo of body weight was given in these cross tests.

The phagocytosis is enhanced by the accumulation of the polymorphonuclear leucocytes in the capillaries of the organs immediately after the injection of the serum. These observations corroborate the findings of Goldscheider and Jakob, that the leucopenia following intravenous injections of protein substances is due to accumulation of the leucocytes in the lungs and other organs, and not to a destruction of the cells. They also prove that the leucocytes are not killed or injured by the intravenous injection of such substances, but are still actively phagocytic.

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### Notes on the surgical physiology of the dog.

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#### I. HYDRONEPHROSIS AND HYDROURETER.

In a previous communication<sup>1</sup> the possible causal relationship of a paralyzed ureter to dilatations of the ureter and kidney pelvis has been pointed out. Of the experiments performed in 1913, 75 per cent. showed hydronephrosis in some degree. Last fall the same technic was repeated in twelve dogs with the following results:

- 2 Negative.
- 6 Hydronephrosis—to some degree.
- 1 Hydroureter.
- 3 Dilatation of cephalad ureter.

Therefore fifty per cent. showed hydronephrotic change and eighty-three and one-third per cent. hydronephrotic and hydroureteric changes combined.

It was realized in applying this information to the origination of a physiological uretero-sigmoid union, some traumatization of

<sup>1</sup>Stewart and Barber, Hydronephrosis, *Annals of Surgery*, Dec., 1914, Barber and Draper, Renal infection, *Jour. Amer. Med. Assoc.*, Jan., 1915.