

twenty-four to forty-eight hours afterward; (2) increased elimination of nitrogen and sulfur, and decreased excretion of phosphorus, in the urine. The amount and consistency of the feces were unaffected.

Repeated hemorrhages from the same animal resulted in (a) cumulative quantitative metabolic effects in harmony with those indicated above, and were followed by (b) steady decline in body weight, and (c) gradual increase in average daily volume of urine, even when the animal ate the same amount and kind of food as at the beginning.

After successive hemorrhages at intervals of a few days the content of nitrogen, sulfur, and phosphorus in the blood, as well as specific gravity and number of red corpuscles, gradually diminished, whereas the leukocytes steadily increased in number.

These data confirm the general metabolic results obtained in the earlier experiments by Bauer and others, and disagree with the opposite conclusions, as to effects on proteid catabolism, announced two years ago by Ascoli and Draghi.

Fourth meeting.¹

Physiological Laboratory of Columbia University, at the College of Physicians and Surgeons. December 16, 1903.

21. Changes in the viscosity of the blood produced by various experimental procedures," with demonstrations: **RUSSELL BURTON-OPITZ.**

The author described and demonstrated the apparatus used in determining the viscosity of the blood. This demonstration was followed by a discussion of the changes in the molecular friction of the blood after intravenous injections of distilled water, and of saline, dextrose, and alcoholic solutions. The effect of alcohol, when introduced into the stomach and small intestine, was also noted. Next were considered the changes following subcutaneous administration of curare and the differences in the viscosity of arterial and venous blood. K , the coefficient expressing the viscosity, was determined before and after each experimental procedure, two or three determinations being made in each case.

¹ Reprinted from *Science*, 1904, xix, p. 104; *American Medicine*, 1904, vii, p. 111; *Medical News*, 1904, lxxxiv, p. 238.

It was found that, if distilled water, in quantities of from 5 c.c. to 50 c.c., is slowly allowed to flow into the facial vein, the viscosity of the blood is increased, but the increase is not considerable. The following experiment may serve as a sample: The normal coefficient K , in a dog weighing 19.2 kilos, was 802.6 or 5.8 times greater than K for distilled water at 37° C. After the injection of 10 c.c. of distilled water, the coefficient showed the value 786.0 or 6.0 times greater than distilled water at 37° C. Normal saline solutions produce the reverse effect, *i. e.*, the blood becomes less viscous. In one case after injecting 10 c.c. of 0.7 per cent. NaCl solution, the viscosity of the blood fell from 5.9 to 5.6 times that of distilled water at 37° C. Concentrated solutions of dextrose (5 c.c.) injected into the facial vein bring about an increase in the viscosity of the blood, which is more pronounced than that produced by distilled water. About a half-hour after the injection the coefficient K shows again its normal value.

If from 3 c.c. to 5 c.c. of 10 or 25 % solutions of alcohol in water are allowed to flow into the facial vein, the molecular friction of the blood becomes greater. The same result can be obtained by introducing the alcohol directly into the stomach or duodenum. After an injection of 30 c.c. of a 25 % solution into the stomach, the viscosity, determined 20 minutes later, showed the value 608.09, as against 664.17, the normal coefficient. Thus, instead of being only 7.0 times greater than that of distilled water at 37° C., it changed after the injection to 7.7 times greater. An equally decisive change occurred after injecting 40 c.c. of a 25 % solution into the duodenum. A marked increase in viscosity also follows subcutaneous administration of curare; however, this result is not evident until the respiratory muscles become paralyzed.

Venous blood is slightly more viscous than arterial, but the difference is often very insignificant.

In all these determinations a direct parallelism exists between the viscosity values and the specific gravity. When the viscosity increases, the specific gravity increases also, and *vice versa*. Not a single exception to this rule was observed.

The viscosity was also determined in a dog having very large thyroid bodies. The right gland weighed 57 gm., the left 52 gm.

The viscosity-coefficient, obtained in eight determinations, showed the value 1233.17 (specific gravity, 1.05028), which means that the blood of this animal was only 3.8 times more viscous than distilled water at 37° C. The lowest previous value obtained by the author occurred in a dog after three days of hunger. K equalled in this case 1110.3 (4.2 times more viscous).

In general, it may be said that the less the viscosity the longer the period required for extravascular coagulation. This was especially well shown in the case just mentioned. Clotting set in after about 15 minutes.

22. "Survival of an animal after removal of both suprarenal capsules, due to a previous grafting of the organ into the kidney," with demonstrations of sections: FREDERIC C. BUSCH and CHARLES VAN BERGEN. (Presented by S. J. MELTZER.)

Dr. Meltzer stated that in several instances survival of a part of suprarenal grafts was obtained after transplantation into the kidney of the same animal.

In one experiment the animal (a rabbit) survived, after apparently all other suprarenal tissue, aside from that which was grafted into the kidney, had been removed. In this case, after total removal of the left suprarenal, a part of the gland, including medulla and cortex, was introduced through an incision into the cortex of the left kidney. Eighty-six days later the remaining right suprarenal was removed *in toto*. The animal survived the operation and was apparently normal for 21 days, at the end of which time it was killed in order to examine the graft. This was found, upon histological examination, to have been replaced in part by connective tissue. The surviving cells apparently belonged to the medullary portion of the suprarenal. The cortex had been replaced by connective tissue. Blood supply was good.

Microscopic sections showing the successful grafts were exhibited. In this connection, also, Dr. Meltzer showed, under the microscope, a section of Zuckerkandel's organ, the chromophilic bodies of which are similar in nature to the chromophilic granules of the medullary portion of the suprarenal capsule.