A Further Note on the Depressoric Action of the Rabbit Blood.

By

Keizo Fuzii.

(藤井敬三)

*(From the Physiological Laboratory of Prof. Y. Satake,
Tohoku Imperial University, Sendai.)*

In the experiments reported previously,¹⁾ an intravenous injection of a small quantity of freshly defibrinated blood of rabbits into a cat under urethane narcosis often resulted in an immediate, though rather small fall followed by a quick recovery of various degrees, but was soon succeeded by a second, profound fall, associated usually with cardiac inhibition.

By changing experimental conditions in certain ways we have studied these two drops occurring in succession, and observations will be presented in the following paragraphs.

Long after closing the present experiments, we found quite the same features demonstrated by Dixon²⁾ about forty years ago in the blood pressure and the respiration in cats on giving orchitic extracts. The interval between the fall, "A" and that "B" varies from 30 to 50 seconds; this also well coincides with the present data. Similar variations were also noted by Vincent and Sheen,³⁾ also long ago, in a dog on intravenously injecting saline decoction of organs such as the brain.

The left carotid artery in a cat, anaesthetized with 1 gm. urethane per kilo body weight, was connected to a mercury manometer. No food was given for 24 hours before the experiment.

Blood was taken from the ear vein of a rabbit, denervated previously. It is taken into a syringe either immediately from the ear vein or after defibrination in an amount of 0.1–0.5 c.c., filled with the Tyrode to 1.0 c.c. and injected into the jugular vein just in 10 seconds, followed

1) Fuzii, Tohoku J. of Exp. Med., 1939, **35**, 264.

2) Dixon, J. of Physiol., 19(00)–01, **26**, 244.

3) Vincent and Sheen, Ibid., 1903, **29**, 242.

soon by injecting 1.0 c.c. Tyrode. The whole manipulation consumed 15 seconds or less. No blood 3 hours after defibrination was used.

During the injection the arterial pressure starts to fall, but usually not to any great extent, and the pulse rate remains almost unaltered, while the respiration is often accelerated. A few seconds after the end of the injection the pressure shows some recovery, sometimes almost complete, at other times only an inclination, and about forty to fifty seconds after the end of the injection the pressure tends again to fall, sometimes in a considerable amount, accompanied occasionally by slowing of the pulse rate. The pressure recovers its initial level in a minute or later according to the magnitude of fall; the pulse rate recovers sooner. There were some cases where the pressure fall was excessive which resulted in the death of the animals eventually. The respiration is accelerated, especially so in the recovery period of the pressure. The whole figure covers usually about 2-3 minutes or longer.

The same figures occur in the blood pressure in rats and guinea-pigs, both urethanized by subcutaneous application, on injecting the freshly defibrinated rabbit blood. No considerably slow pulse was manifested here, contrary to the cat experiment.

Freshly defibrinated blood of dogs does not act to bring about the blood pressure fall of such a figure

Fig. 1. Reduced to 1:3. Cat ♀, 1.5 kilos. 2 grms. urethane per os. The upper curve.....blood pressure by means of the mercury manometer; the second.....that with the Hürthle's manometer; the third.....zero-line, at signal 0.5 c.c. freshly defibrinated rabbit blood + 0.5 c.c. Tyrode; the lowest.....time in seconds.

Fig. 2. 1/1. Rat, urethane subcutaneously; the upper curve.....blood pressure with the mercury manometer, the middle line.....zero-line with signal (0.25 c.c. rabbit blood + 0.25 c.c. Tyrode i.v.), the lower.....time in seconds.

if applied intravenously in similar doses in cats, rats, or guinea-pigs under urethane.

The red blood corpuscles were taken from the rabbit ear vein blood, defibrinated, by centrifugalization, washed three times with the Tyrode, and applied intravenously into a rabbit. The outcome is shown in Fig. 3, a and in that on the left side of Fig. 3, c. The fall "A" was absent there, while the fall "B" became manifest as with the defibrinated blood of rabbits.

The serum alone acts to occasion the "A" fall only. (Fig. 3, b)

Finally the defibrinated blood of rabbits was haemolyzed by adding the same volume of distilled water, then after adding that volume of double Tyrode, it was applied into a vein of the cat, urethanized. The blood pressure falls profoundly, but it corresponds to fall "A" in the time relation. (Fig. 3, c the right tracing)

From all the data above shown, it might be supposed that the second, profound fall "B" of pressure is due to the haemolysis of rabbit blood in the general circulation of cats, rats, etc. The first fall "A" is due to the serum; chiefly at least; that is, if the defibrinated blood is

Fig. 3, a...0.5 c.c. rabbit red corpuscles+0.5 c.c. Tyrode (urethanized cat, ♀, 3.5 kilos); 3, b...0.2 c.c. rabbit serum+0.8 c.c. Tyrode (urethanized cat, ♀, 2.9 kilos); 3, c...0.2 c.c. rabbit red corpuscles +0.8 c.c. Tyrode; and 0.2 c.c. corpuscles+0.4 c.c. water, then+0.4 c.c. double thickened Tyrode (urethanized cat, ♀, 2.0 kilos).

already vitiated with some haemolysis, the latter fact must be also taken into account for causing the fall "A".

In some cats under urethane, the suprarenal glands were removed, the splanchnic nerves or the vagi cut, or atropine was given (0.5 c.c. of 0.1% atropine sulphate); all these procedures did not effect the occurrence of the double falls "A" and "B" of pressure. However, they made their appearance only slowly and in some reduction in magnitude.—A meteriolation of the general conditions of animals, as the consequence of the foregoing operation is to be accounted for by the slowness and smallness in the vascular responses. It is scarcely necessary to say that the bradycardia did not occur after the double vagotomy or atropine: A slight tachycardia was sometimes observable there. The present outcomes with rabbit blood in the vagotomized or atropinized cat differ from those with testes extract of Dixon.²⁾

Removal of the spleen effected the pressure events just as the foregoing manipulations, and in addition to it of ligating the liver artery and the portal vein acted to reduce further the responses in their rapidity and magnitude.

Finally, it may be added that blood of rabbits, deprived of both suprarenal capsules some weeks in advance, has quite the same qualities as the normal in respect to its vasodepressive action when given to a cat.

SUMMARY.

When freshly defibrinated blood of a rabbit is introduced intravenously into a cat, rat, or guinea-pig, under urethane, there occurs in the arterial blood pressure two successive falls, the first rather short, usually a relatively small fall, and the second prolonged, usually relatively considerable which starts about forty to fifty seconds after the injection and is accompanied sometimes by bradycardia.

The red cell of rabbit, intravenously injected, causes the second of the same events, and if it be haemolyzed, it causes also a profound fall of pressure, but in the time relation coincides with the first fall. The blood serum evokes only the first fall in the pressure.

Thus, the second, profound fall of pressure is probably due to haemolysis of the rabbit blood in the blood circulation system of cat.

Interference with the suprarenals, splanchnic nerves, vagi, spleen, spleen with the liver arteries and portal vein, or atropine do not affect the appearance of both the falls of pressure.