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AN OUTFLOW RECORDER USEFUL FOR DETECTING SMALL AMOUNTS OF VASOPRESSIN

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The recorder to be described has been used successfully to record the outflow from small perfusions when the flow is between the ranges which can readily be recorded by the drop timer and the outflow recorder of Gaddum (1929, 1938).

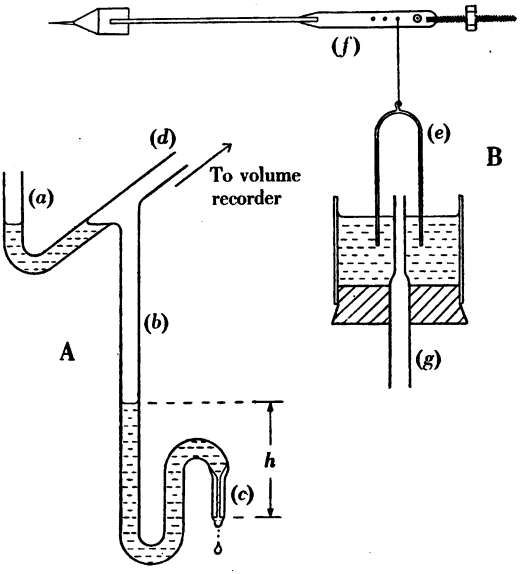

Fig. 1. A, the outflow recorder. The flow enters at (*a*), flows down the tube (*b*) and out at (*c*). The greater the flow the higher the level of fluid in (*b*), air is displaced and the volume recorder B transfers this movement to a smoked drum.

The recorder is shown diagrammatically in Fig. 1 A. The flow to be measured is delivered at (*a*) and runs down the side of the glass tube (*b*) around the S-bend and out at the capillary (*c*).

The rate at which the fluid passes the capillary depends on the pressure due to the height of fluid *h* in the tube (*b*), and for any steady rate of flow the

height adjusts itself until the pressure is just sufficient to send this flow out through the capillary. If the flow increases, the level in (*b*) rises until the pressure is sufficient to deal with the new rate. The rise of the level of fluid displaces air and since this is prevented from escaping at (*a*) by the fluid, it is transferred along tube (*d*) to the volume recorder. This volume recorder may be the usual piston recorder, or may be similar to that shown in Fig. 1 B. This consists of a glass dome (*e*) suspended from the arm of a writing lever (*f*) over the opening of a tube (*g*) in which the displaced air is moved. The glass dome and the tube (*g*) are both coated with a thin layer of paraffin wax in order to prevent the surface tension of the surrounding water drawing them together.

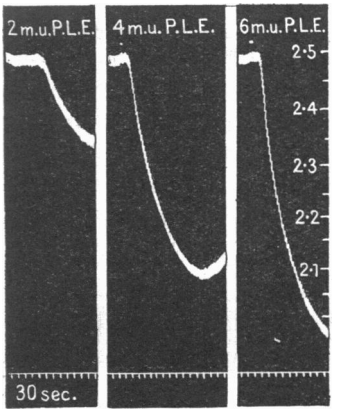

Fig. 2.

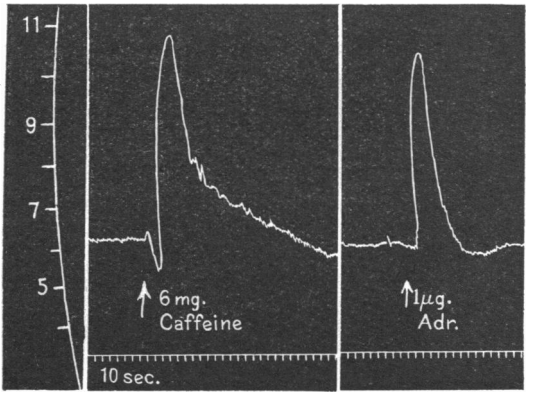

Fig. 3.

Fig. 2. Record of the outflow from the hind legs of a rat perfused with Ringer-Locke; approximate scale in ml. per min. Constrictions produced by 2, 4 and 6 m.u. of posterior lobe extract.

Fig. 3. Record of the coronary flow of a rabbit heart (Langendorff preparation) with approximate scale in ml. per min. Dilatations produced by 6 mg. caffeine sodium salicylate and 1 μg. adrenaline.

The sensitiveness of the recorder depends on several factors: (1) the resistance of the capillary tube which depends on its length and diameter. The greater the resistance the greater is the volume change produced by a change of flow. (2) The diameter of the vertical tube (*b*); an increase in its diameter necessitates a larger volume change in order to produce a given pressure change. In addition the sensitivity of the whole apparatus depends on that of the volume recorder. Thus the recorder may be made sensitive to the small changes in flow either by having a very sensitive volume recorder or by producing large volume changes from the changes in flow. A large volume change, however, is only obtained at the expense of an increased delay before the new level is attained.

As it has been used the dimensions of the apparatus have been as follows: length of writing lever 31 cm., distance of attachment of glass dome from fulcrum 1·5 cm., the diameter of the dome 1·5 cm. For the tracing shown in Fig. 2 the diameter of tube (*b*) was 0·45 cm. and the capillary approx. 1 cm. long and 0·07 cm. in diameter. For Fig. 3 the dimensions were 0·7, 1 and 0·035 cm.

Detection of vasopressin. The blood vessels of the rat are very sensitive to the action of the extract from the posterior lobe of the pituitary gland, and provide a sensitive test for detecting the presence of the pressor hormone. When a preparation of the hind legs of a rat, perfused through the abdominal aorta with Ringer-Locke at room temperature, has been working for 4–5 hr. it will respond to 2 m.u., some preparations responding well to 1 m.u. or less. In order to obtain consistent effects 15–20 min. must elapse between injections, but the life of the preparation is long, and responses can still be obtained when the preparation is 24 hr. old. Fig. 2 shows the effect of 2, 4 and 6 m.u. The oscillations of the record are due to the individual drops of perfusate arriving in the tube, each drop causing a sudden increase in the level of fluid, which then declines again until the arrival of the next drop.

Record of coronary flow. The apparatus has also been used for recording the outflow from an isolated heart perfused through the coronary vessels by Langendorff's method. Fig. 3 records the outflow from an isolated rabbit's heart; the dilatations are produced by 6 mg. of caffeine and 1 μg. of adrenaline. In many rabbit hearts adrenaline produces little coronary dilatation, but this is not always so.

SUMMARY

An outflow recorder is described which gives a continuous record. The height of the line is an indication of the flow. The instrument is especially useful for recording the flow from the perfused vessels of the rat, which are sensitive to amounts of pituitary posterior lobe extract equal to 1 m.u. or less.

REFERENCES

Gaddum, J. H. (1929). *J. Physiol.* **67**, 16*P*.
Gaddum, J. H. & Kwiatkowski, H. (1938). *J. Physiol.* **94**, 87.